The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XV SEPTEMBER, 1904 No. 9

CONTENTS

PAGE

A Winter Expedition into Southwestern Mexico. By E. W. Nelson. Illustrated 341

Building the Alaskan Telegraph Line. By Captain William Mitchell, U. S. Army 357

The Fisheries of Japan. By Hugh M. Smith, of the Bureau of Fisheries 362

What the U. S. Geological Survey has Done in 25 Years . 365

Colossal Natural Bridges of Utah. Illustrated 367

Gazetteers of the States 369

A Notable Norwegian Publication. By Charles Rabot . . 370

Geographic Literature 371

Program and List of Delegates and Members of the Eighth International Geographic Congress 373

Published by the National Geographic Society,
Hubbard Memorial Hall,
Washington, D. C.

$2.50 a Year REPRINT 25 Cents a Number

Entered at the Post-Office in Washington, D. C., as Second-Class Mail Matter

XUM

THE NATIONAL GEOGRAPHIC MAGAZINE

AN ILLUSTRATED MONTHLY, published by the NATIONAL GEOGRAPHIC SOCIETY, at Washington, D. C. All editorial communications should be addressed to the Editor of the NATIONAL GEOGRAPHIC MAGAZINE, Hubbard Memorial Hall, Washington, D. C. Business communications should be addressed to the National Geographic Society, Hubbard Memorial Hall, Washington, D. C.

---

25 CENTS A NUMBER; $2.50 A YEAR

Editor: **GILBERT H. GROSVENOR**

Associate Editors

GENERAL A. W. GREELY
Chief Signal Officer, U. S. Army

W J McGEE
Chief, Department of Anthropology and Ethnology, Louisiana Purchase Exposition

C. HART MERRIAM
Chief of the Biological Survey, U. S. Department of Agriculture

WILLIS L. MOORE
Chief of the Weather Bureau, U. S. Department of Agriculture

O. H. TITTMANN
Superintendent of the U. S. Coast and Geodetic Survey

O. P. AUSTIN
Chief of the Bureau of Statistics, Department of Commerce and Labor

DAVID T. DAY
Chief of the Division of Mineral Resources, U. S. Geological Survey

IDA M. TARBELL
Author of "Life of Napoleon," "Life of Lincoln," etc.

CARL LOUISE GARRISON
Principal of Morgan School, Washington, D. C.

WASHINGTON, D. C.

VOL. XV, No. 9 WASHINGTON SEPTEMBER, 1904

THE NATIONAL GEOGRAPHIC MAGAZINE

A WINTER EXPEDITION IN SOUTHWESTERN MEXICO

BY E. W. NELSON

BIOLOGICAL SURVEY, U. S. DEPARTMENT OF AGRICULTURE

THE southern end of the Mexican tableland is a broken plain, varying in altitude from 5,000 to 7,500 feet above the sea. Hills and mountains are distributed irregularly over its surface, with level valleys of varying size lying between. The soil is fertile, and these level areas produce abundant crops of wheat and corn, besides many fruits and vegetables of the temperate zone. The rainy season comes in summer, but the rainfall is often so scanty that the crops are much benefited by irrigation when water is available. The winter climate is ideal, with abundant sunshine and just enough frost at times to make the air bracing.

The land is mainly in the possession of wealthy *haciendados*, who usually live in the larger towns. The laborers, or *peones*, are paid scanty wages, and, according to our standard, are miserably poor. Their own point of view, however, is different, for, having but few wants, they are a contented and cheerful race, undisturbed by care so long as the day's needs are assured. Life among them is close to its primitive elements, families often living in little huts thatched with grass and cornstalks. These people vary greatly in their attitude toward passing strangers. During my years of wandering through remote parts of Mexico, however, I have frequently been compelled to claim their hospitality, and have often been received with a frank cordiality and delicacy of attention that would have done honor to a higher plane of life.

This part of Mexico is traversed by railways, and the resulting influence of the outside world is gradually affecting the picturesque local customs that are so attractive to visitors. Half a dozen cities, including the three largest in Mexico, are situated on the southern border of the tableland. They are full of interest, from the oriental character of much of the architecture left by the Spaniards, but modern improvements are now becoming much in evidence in the larger places.

The visiting tourist and his camera are still objects of curiosity to the street

At San Luis Potosi. A Street Crowd Watching a Photographer

Photo by Scott

Photo by Nelson

Loading Outfit on Pack Mules

crowd. This is especially marked if the visitor sets up his instrument in the market place. The people are good natured, and merely gather to watch the doings of the "gringo," whose ways are amusing but past comprehension. By focusing the camera away from the crowd and then turning it quickly a characteristic group can be secured.

The tableland is bordered on the south by the mountain wall of the Sierra Madre, which in this section has an easterly trend. A belt along the northern base of these mountains and including the adjacent edge of the tableland may be called the Lake District of Mexico. This belt extends from the valley of Mexico to the State of Jalisco, and contains over a dozen shallow, fresh-water lakes, varying in size from four or five to seventy miles in length. This belt also covers a considerable part of the area of the most recent volcanic activity in Mexico, and the lakes all owe their origin to changes of level due to volcanic forces. Situated more or less intimately among the foothills and outlying mountains of the Sierra Madre, they present many beauties of scenery that render them most attractive.

Lake Patzcuaro, in Michoacan, is especially noted for its beauty. It lies among pine and oak grown mountains, at 7,500 feet above sea level, and has several small islands on its bosom and a number of picturesque Tarascan Indian villages on its borders. One of these villages is Tzin-Tzun-Tzan, where in a rude little chapel is located the famous painting by Velasquez, representing the Descent from the Cross. After reading the highly flavored ac-

count in "A White Umbrella in Mexico" of a visit to this picture, one feels quite defrauded of his just dues of adventure in making a prosaic trip there on a raw-boned pony over a few miles of trail.

The eastern end of Lake Chapala, in Jalisco, was the starting point of the real work of our expedition. This is the largest fresh-water lake in Mexico, being about seventy miles long and fifteen miles wide. One of its peculiarities is that the inlet and outlet of the lake are both at the eastern end, and only a few miles apart. The Spaniards had the custom of naming both their streets and rivers in sections, and this accounts for the river flowing into Lake Chapala being called the Lerma, while the continuation of this stream, forming the outlet, is named the Santiago. Many small towns and villages are found around the shores of the lake, and considerable local trade is carried on in large, flat-bottomed boats, with square sails, and thatched roofs in place of decks.

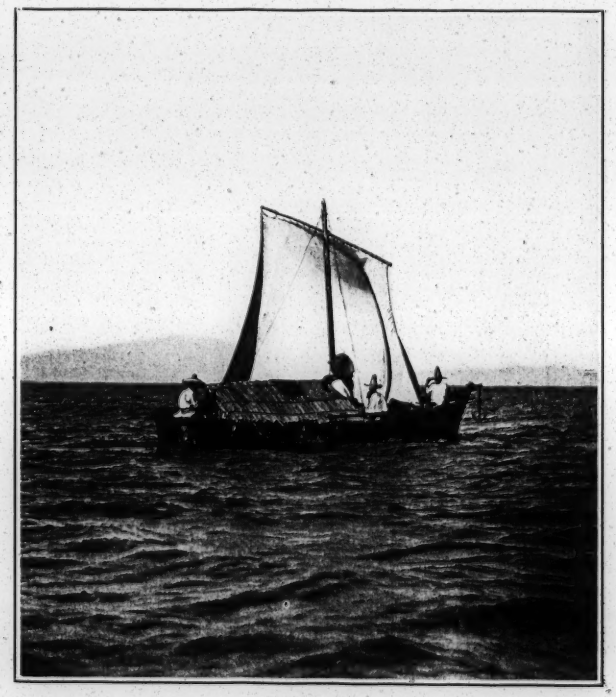


Photo by Nelson

Boat on Lake Chapala, with a Square Sail and Thatched Roof Over Stern. This is the Largest Freshwater Lake in Mexico

Traffic among the people of this region is commonly on a small scale, and both men and women sell their wares, often the product of their own labor, in the market places. There is also a class of itinerant traders, who go from town to town, as markets are held on different days, carrying their wares upon their backs. These peddlers add greatly to the local color of the market places. The junk sellers, in particular, always excite interest from the strange collection of odds and ends they spread upon the pavement. Their wares include almost every imaginable object of metal from old coins to wicked-looking daggers and agricultural implements. In one such collection in an Indian town I found an old dueling pistol of excellent workmanship, bearing the name of a London maker.

There is a curious blending of the archaic and modern among the lower classes of Mexico. They patronize the railroads and buy many modern products, yet among them are found the survivals of various primitive industries. Many of them in the region about Lake Chapala still spin cotton by means of a slender spindle, with a clay whorl like those found everywhere in prehistoric village sites. The spindle is twirled

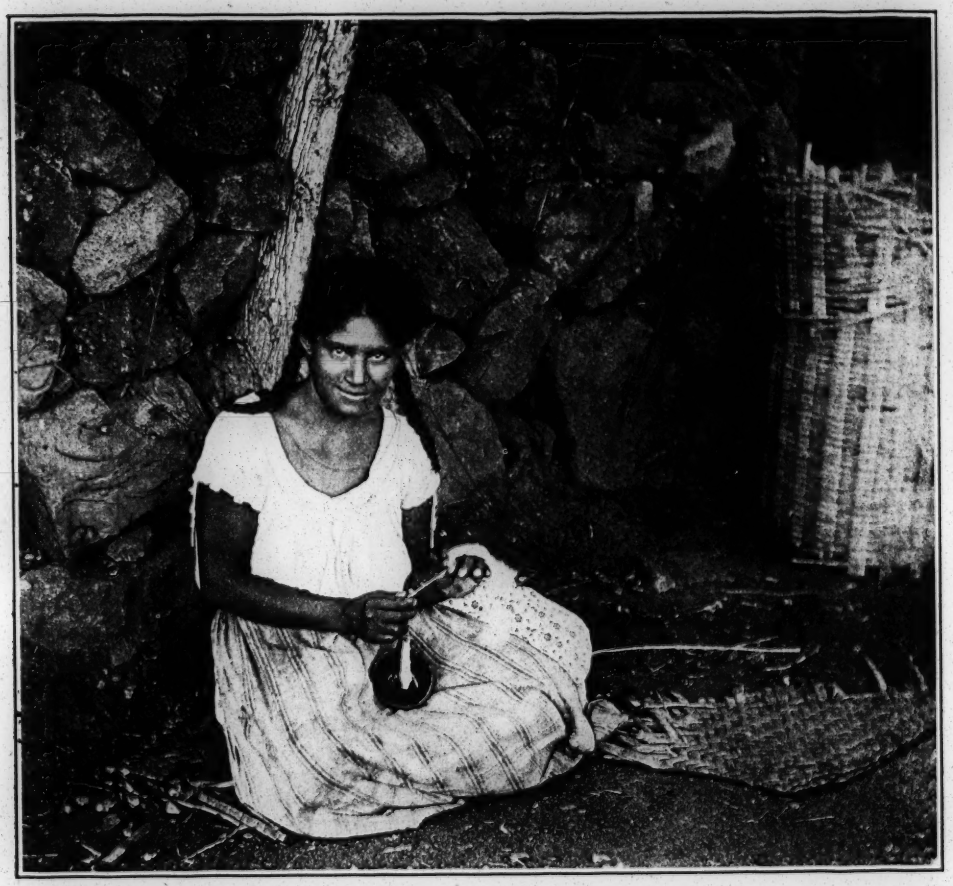


Photo by Scott

Indian Woman Spinning with Spindle, Lake Chapala. The Ancient Mound Builders Used to Spin in the Same Way (see page 344).

like a top in a bowl, the spinner deftly running out the cotton, then letting the thread wind on the spindle as the motion slackens. The thread made in this manner is afterwards woven on an equally primitive loom, which is attached at one end to the wall or a tree trunk and held taut by a broad band passing about the weaver's back.

The slopes of the hills about Lake Chapala are rather bare of large vegetation, but scattered cactuses of giant size give character to the landscape. The marshes about the eastern end of the lake are favorite wintering places for large numbers of ducks, geese, and other water fowl from the far north.

On December 24 we crossed the end of the lake in a large sail-boat to the border of the largest of these marshes, where we planned to spend Christmas among the birds. The day was brilliantly clear, with just a suspicion of frost in the air. As evening came on the wind fell, leaving us on the lake, where we could enjoy the marvelously

beautiful closing of the day. The sun had gone behind the distant mountains in a golden glory, and as the rich afterglow slowly faded the mellow sound of vesper bells came floating across the water. Then a brilliant array of stars came out and the black shore line twinkled cheerfully with village lights.

We slept in the boat, and were awakened on Christmas Day by the calling of flocks of wild geese as they took wing at the first glimpse of dawn. We found here the white-fronted and snow geese, marsh. The magnificent volume of sound from beating wings served as a background for the shrill clanging of the geese, and all united to produce an inspiring outburst of nature's music. In the afternoon we were delighted by the discovery of a colony of Mexican cormorants, nesting in a line of scattered bushes growing in a shallow part of the lake. As the nesting habits of this bird were previously unknown, this discovery was as fortunate as unexpected. By removing our clothing and wading waist

Photo by Scott

An Indian Woman Weaving with a Primitive Hand Loom, Lake Chapala

with more than a dozen species of ducks, besides various other water birds. The geese and ducks were present in vast numbers, and, as we advanced into the marshes in a small boat, they kept retreating by short flights, until finally they became massed in such numbers that there seemed no more room for them. Then they arose, thousands upon thousands, until the air was heavy with the mighty thunder of countless wings, and the horizon blackened by the hurrying forms moving to distant parts of the deep through the mud and water ahead of the boat, we secured photographs of some of the cormorants before they flew. There were many nearly completed nests, only a few of which contained eggs.

From Lake Chapala our route lay southward through the mountains away from the railroad, so that we were obliged to outfit for the trip by purchasing saddle horses and pack-mules and hiring a Mexican mule-driver. On the mules we carried our bedding, clothing, cook-

ing utensils, and supplies of all kinds, in addition to the specimens collected between shipping points. With this outfit, Mr. Goldman and myself, with our man, traveled about one thousand miles through a little-known country during the next few months. We were at home wherever night overtook us, only asking the place to furnish water, fuel, and grass. Traveling in this way has its irksome features, such as the daily packing and loading of the outfit, which takes an hour or more, but as a compensation one tastes all the joy of a wild free life under the open sky.

In January we passed some time working on Mt Patamban, in Michoacan. The summit of this peak has an altitude of about 12,000 feet. This is near timber line, and the scrubby pine (*Pinus hartwegi*), tree alders, and bunch grass growing there were characteristic of the plant life found in the timber-line belt on all of the higher mountains of southern Mexico. In February we reached Mt Tancitaro, a little farther to the south. This mountain is over 12,000 feet high, and at the time of our visit the upper 1,000 feet of the north slope was covered with snow. Before making camp on Mt Tancitaro we made a preliminary visit to the western slope to find a good situation. Early in the afternoon we stopped in the dense forest on the mountain side, and while there heard a heavy subterranean report

Photo by Goldman

Tarascan Houses, Cirosto, Michoacan

Notice the Projecting Wooden Pegs on the Roofs, also the Roofs to the Gates

like the distant firing of a great gun. We waited expectantly for the earthquake shock which former experience told us frequently followed such a sound. Nothing came of it, however, and the incident passed from our minds. As we rode down the mountain in the afternoon we had an unobstructed view across the lower land to the volcano of Colima, on the western horizon. The top of the volcano was hidden in a large, well-defined black cloud, forming a flattened oval mass, inclosing the entire upper part of the mountain and extending some distance in each direction. This showed that there had been an eruption of the volcano while we were in the forest, and the sound we heard had evidently been the explosion when the eruption began.

We camped in the midst of a noble forest of pines and oaks on the west slope of the mountain at about 7,500 feet altitude. All about us was a luxuriant undergrowth of flowering herbs and shrubs. Numberless blossoms gayly spangled the forest with brilliant purple, blue, white, and yellow. A little higher up the mountain was a forest of firs, and below were lindens, hornbeams, and dogwoods. We cleared a gently sloping spot just below a great oak log, and there, with nothing but the sky above and the forest round about us, we lived for about a week. Just at one side of the camp grew a patch of blue-flowered sage eight or nine feet high. Humming birds were constantly glancing about among these flowers, and many shy woodland birds took shelter

Photo by Goldman

Collared Peccary, Guerrero

Photo by Nelson

Papayo, a Characteristic Hot Country Village in Guerrero

among the foliage while they peered out curiously at the strange intruders. The memory of this camp is especially impressed on my mind by the extraordinary beauty of the sunsets. From our elevated position there were several points from which the view was unobstructed across 60 miles of intervening country to the volcano of Colima, on the western horizon. The recent eruption of the volcano had filled the air with fine volcanic dust, which at sunset caused the western sky to glow vividly rose red, flooding the mysteriously darkening aisles of the forest with rich shades of color.

The solitaire and other birds made music in the forest throughout the day, but the vesper song of the gray-breasted robin (*Merula tristis*), uttered during the expectant hush of twilight, was beyond comparison the most entrancing bird music I ever heard. Every evening the song of this bird came from some neighboring tree top with such exquisite melody that one almost forgot to breathe. Our mule-driver was one of the most stolid and unemotional men I ever saw, yet this song pierced even his shell.

Every day or two Indians came up the mountain, passing our camp, on their way to the summit after loads of ice, which they carried on donkeys down to the towns on the hot plains six or eight thousand feet below. The snowy summit of the mountain and the wintry scene across the top of the range made it difficult to realize while one stood chilled in the cutting wind that the yellow plains along the southern base were far

Photo by Goldman

Women—Half Negro, Half Indian—Going After Palm Nuts, Papayo

below frost line in the Tropics. My horse saw snow for the first time here, and it was only after long urging that he could be made to cross a patch of it.

This region was the home of the ancestors of our domesticated turkeys. They were found wild here, domesticated by the Aztecs, and introduced into the Old World by the Spaniards soon after the conquest. It was with a special desire to secure specimens of these birds that our camp was made on Mt Tancitaro. In this we were disappointed, though the Indian hunters who visited our camp said that wild turkeys were formerly abundant on the mountain, but that by watching the few watering places, the hunters had long ago exterminated them. They added that the deer on the mountain would soon be gone like the turkeys.

We passed our first night after leaving Mt Tancitaro in the village of Cirosto, a characteristic Tarascan Indian town, with numerous roofed gateways and houses walled with massive hewed planks well fitted together and without window openings. The doors and projecting ends of the rafters are often curiously carved and the hand-made shingles are fastened down with rows of wooden pegs with long projecting ends. This peculiar Tarascan architecture is strikingly picturesque.

The Tarascan country is covered mainly with open yellow pine forest, much like the forested plateau of northern Arizona. For many miles our trail

led through this forest. One morning we met some soldiers escorting three prisoners to a neighboring town. They were quite friendly and appeared to be pleased with our desire to secure a photograph of them.

From the cool mountain slopes we descended southward into the arid tropical

Photo by Nelson

Figtree Coiled on Nut Palm

regions of southern Michoacan. This is mainly a mountainous area with scattered plains here and there. The plains are usually like grassy prairies with irregular patches of scrubby trees and shrubs about their borders. After crossing one of the largest of these plains under the intense heat of the tropical sun it was a relief to reach the shelter of overhanging mahogany and other trees near the river at the bottom of a deep canyon. It was a wild and solitary spot, where we camped for about two weeks. Quite unexpectedly we found here the wild turkeys we were in search of. They were rather common in flocks, frequenting the sides of the canyon and coming to drink along the river. Another habitant of this place was a solitary old caiman, who lurked in the deep pools of the river and came out for two or three hours at midday to bask in the sun. The caiman of western Mexico ascends the larger rivers, particularly the Balsas and its tributaries, on one of which we were camped, several hundred miles from the sea.

Owing to the great diversity of physical conditions, the vegetation in Mexico assumes a wonderful variety of form, and presents a never-ending series of novelties to the traveler. On some sun-baked cliffs near our camp in the canyon was a singular agave, growing as though plastered on the bare rock, and quite unlike anything that we had ever seen.

From this camp we crossed several ranges of hills, sometimes forcing our way, without a trail, through dense jungles of scrubby growth to the recently extinct volcano of Jorullo. The summit of this volcano is only a little over 4,000 feet above sea-level, and the basal slopes are overgrown with scrubby arid-tropical vegetation. On the north side of the volcano, however, at about 3,500 feet altitude, is a small area of pine and other tree growth only found at a much higher altitude on the slopes of adjacent mountains. Jorullo was visited and described by Humboldt, who collected various new plants there. It is only recently extinct, and there is a bare black bed of lava on the northwest side where the crater wall is broken down. It is a small cone, only rising about 800 or 1,000 feet above the general

Photo by Goldman

Round Hut of Negros, South of Acapulca, Guerrero

The Negros in this region have crowded out the Indians. This is the same kind of house that their ancestors built in Africa

elevation, and is overtopped by some of the neighboring low mountains.

From Jorullo we again turned southward into the valley of the Balsas River. The Balsas is the largest river system of Mexico, its tributaries rising far in the interior of several states. The main river flows from the border of Puebla through the state of Guerrero to the Pacific. Throughout most of their courses the main stream and many of its tributaries flow through an arid mountainous region, sparsely populated, and with but little to attract exploitation except perhaps the possibility of mines. The immediate valley of the Balsas has an abundant growth of various kinds of large cactuses, with thorny shrubs and low trees.

A few days' travel beyond the Balsas, on a trail that seemed to wind endlessly over and about brush-covered hills, brought us to the coast of the Pacific. As we reached the crest of the last high ridge a fine view of the blue ocean refreshed our sun-dazzled eyes, and some whitened rocky islets a few miles offshore gave promise of our finding sea fowl there. We reached the shore at the small village of Sihuatanejo, situated on a bay of the same name. The bay of Sihuatanejo forms a good harbor, and has been considered as the possible terminus of a transcontinental railroad from the City of Mexico. The road has been completed for some years as far as the Balsas River, in central Guerrero, but whether it will be ex-

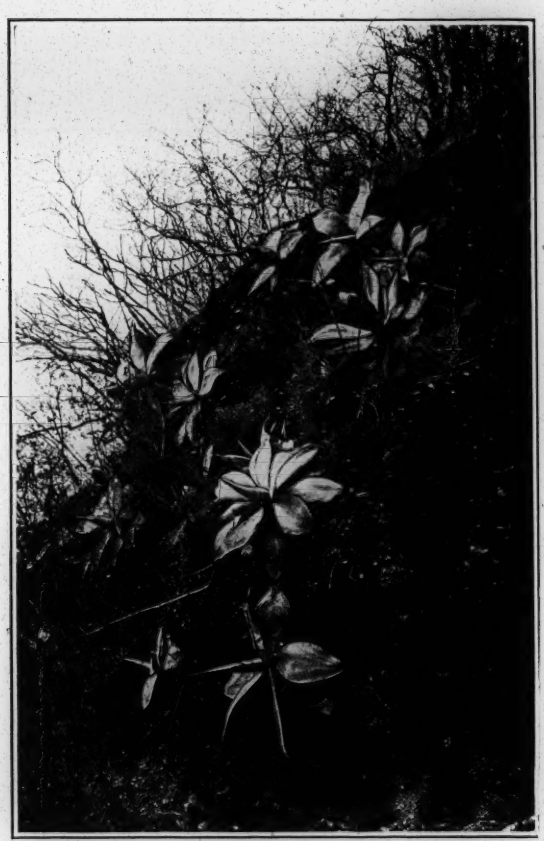


Photo by Scott

Curious Species of Agave Growing on Cliffs

tended across the mountains to Acapulco or follow down the Balsas and reach the coast at Sihuatanejo appears to be still undecided.

The day following our arrival, after securing a dugout canoe with three paddlemen, we made an early start for the bird rock. Many northern phalaropes were circling from place to place over the sea or swimming about as light as thistledown on the surface. It was the first time we had ever seen these little waders in Mexico, and finding them made an encouraging beginning to our excursion. As we drew near the islet an occasional red-billed tropic birdor bridled tern passed over, and soon a great swarm of birds could be seen about the rock. Among these were two species of terns, the tropic bird and Brewster's gannet.

The rocks rose so precipitously from the sea on all sides that it was only after circling them for some time that we found a possible landing place. Finally a ragged point, where the broken rocks gave hand and foot hold was chosen. Then the canoe was brought close in, and as the swell lifted it almost against the rocks, we made flying leaps from the bow and landed successfully with our cameras. The most beautiful habitant of these rocks was the tropic bird with its coral red bill, satiny white and black plumage, and long, filament-like middle tail feathers. Their graceful flight and long trailing tail feathers at once attract attention. Dozens of them were nesting in crevices among the rock, and one of the parents was usually at home, always ready to meet a trespasser with shrill cries and powerful thrusts of its sharp beak. They were so persistent in defense of their homes that they could be dragged out of the nesting holes before they would make any effort to escape. The gannets nested upon the surface, laying two eggs on the bare rocks or sometimes on a rude collection of moulted quill feathers which they gathered from the vicinity.

The most unexpected result of our visit to Sihuatanejo was the discovery of an inaccessible rocky islet rising about 200 feet above the sea, with numerous small cavities near the summit, which were occupied as nesting places by thirty or forty pairs of large red and green macaws. As the canoe ap-

proached its base, the macaws launched out from their perches and circled overhead, shrieking their protest at our presence. These birds commonly feed far inland; so their choice of a sea-beaten rock for a nesting place necessarily entails long daily flights to and from their feeding ground, but it affords absolute security for their eggs and young.

One's preconceived ideas of the tropics are usually of a region overgrown with luxuriant vegetation, always vividly green, and spangled with flowers, brilliant birds, and insects. In the arid tropics, however, quite the reverse is true during the long dry season. The length of the dry season is a controlling factor in limiting vegetation to a more or less stunted growth of jungle, including many thorn-bearing species. The low forests of the arid tropics are frequently as leafless during the dry season as northern deciduous forests in winter. Along streams and in low areas, where the underground water is near the surface, the trees attain a much more vigorous growth, and are vividly green throughout the year.

From Sihuatanejo we proceeded down the coast to Acapulco. The road was a narrow trail leading through endless jungle, and connecting a series of squalid villages standing in small clearings.

With the exception of birds, animal life was not much in evidence, although the collared peccary and a species of white-tailed deer was common. There are many tales in hunting literature of the fierceness of the peccaries, and they are undoubtedly stubborn fighters against any odds when brought to bay, but, so far as my experience goes, they appear to be much more dangerous in books than in their native jungles. All along the route to Acapulco we saw among the bushes smoothly made little roads, from which every leaf and twig had been removed and the ground cleaned as carefully as though swept each day. These roads were three or four inches wide, and usually led to a hole under a log or root, or sometimes to a large nest of dry sticks two or three feet high. The makers of these roads and nests are small nocturnal rodents, about the size of a house rat, which are peculiar to the tropical forest of western Mexico. The care with which they keep their roads free from twigs and other objects is surprising.

Here and there along the coast occur great ceiba or silk cotton trees. They are the giants among the plant life of this region, and among the noblest and handsomest of tropical trees. The pods of the silk cotton are large and well filled with silky down, which is gathere

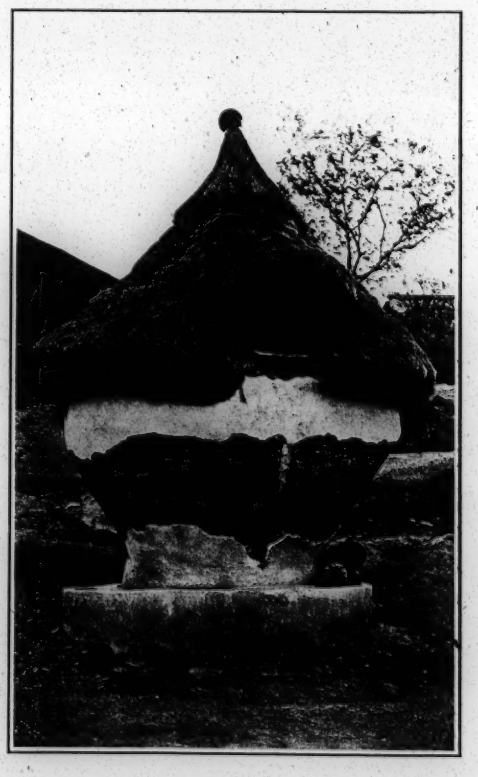


Photo by Scott

Moated Corn Crib, near Cuernavaca

and exported to the United States for making pillows and mattresses.

Before reaching Acapulco we stopped for more than a week at the small village of Papayo. It is a characteristic hot-country village, made up of a collection of palm-thatched houses with walls of adobe brick or wattle. The center of the village is occupied by a large wide-spreading ceiba, while surrounding it for some distance in various directions is a magnificent forest of nut palms. The main industry of the people here is gathering the palm nuts and extracting the kernels. Every morning the village women went out into the forest with baskets to gather the nuts. The kernels are sent on pack-mules to Acapulco, where the oil is extracted and used in a soap factory conducted by Americans.

Our quarters were in an open thatched shed, which served as the living room for the family of the chief man of the village. It was a very comfortable place during the day, but at night the half-starved village dogs swarmed in and searched minutely for every edible scrap or fought and howled just outside.

Among all the forms of vegetable life in the Mexican tropics the wild fig trees are the most remarkable. There are many species, and they vary much in habits and appearance. Some of them show such apparent intelligence in their mode of growth and their readiness to meet emergencies that it is difficult to not credit them with powers of volition. In the tropics, where the wild figs flourish, there is a constant struggle for life among numberless species of plants. Seedlings on the ground have a hard time to reach an age of comparative safety. Certain of the wild figs appear to have learned this, and provide a fruit which is a favorite food for many birds; then an occasional seed is dropped by a bird where it finds lodgment in the axil of a palm frond high in the air. There, sheltered from danger, the seed takes root and is nourished by the little accumulation of dust and vegetable matter. It sends forth an aërial root, which creeps down the palm, sometimes coiling about the trunk on its way. When this slender, cord-like rootlet reaches the ground, it secures foothold and becomes the future trunk of the fig tree. After the descending rootlet has secured itself in the ground, a branch, bearing a few leaves, springs from the seed in the palm top, and a vigorous growth begins. Then the fig gradually enlarges and encloses the supporting palm trunk until the latter is completely shut in the heart of its foster child and eventually strangled.

All along the dry coast plains a species of large-thorned acacia is abundant. The great thorns are hollow, and each is pierced by a small round hole, which is the doorway of a fiery-tempered little ant-like insect which makes its home within. These thorns are so numerous and such singular-looking things that the new comer is always tempted to approach and take hold of a branch to get a closer view. Instantly the occupants of the thorn swarm out with marvelous rapidity over the offending hand. Each one seizes the skin in its jaws and then works a highly spiced sting so vigorously that one's curiosity is satisfied without delay.

The approach to Acapulco is commanded by bold and rugged headlands with many large cactuses on their seaward faces. This port has been of importance since early in the Spanish occupation. It is the best available harbor on the Pacific coast of Mexico and is an important coaling station. The town has long borne an evil reputation for its climate. It has about 4,000 inhabitants and a most flourishing graveyard.

The coast belt in both directions from Acapulco, especially to the south, is largely peopled by descendants of negroes who must have obtained foothold

here during the Spanish occupation. Although the majority of them are of mixed blood, there are apparently many full-blooded negroes. They speak only Spanish and have crowded out the original inhabitants. Most surprising of all, they have retained to this day in many of the villages the characteristic African round hut, with conical thatched roof.

From Acapulco we turned inland and a week later were at Omilteme, on the top of the high sierra which traverses the interior of Guerrero parallel to the coast. This is a limestone range with a very rough, broken summit, where, between six and nine thousand feet above sea-level, we found a magnificent oak and pine forest. Fan palms were abundant in the more open parts of the forest, while in the dark gulches, under the shade of the giant trees, were beautiful groups of tree ferns. Our stay here was very productive, as we found many rare birds which were lacking in our collection, in addition to several species previously unknown to ornithologists.

Several days after leaving Omilteme we reached a station on the railroad leading to the City of Mexico and disposed of our outfit.

Before arriving at the City of Mexico we passed through Cuernavaca, the capital of the State of Morelos. This is an interesting old place, with remains of the ancient Aztec occupation as well as of the Spanish times. One of the survivals among the Indians in this vicinity is the curious urn-like type of corncrib built with a projecting base and a channeled groove or moat in the base, which is filled with water to prevent ants and other destructive insects from gaining access to the corn.

At Cuernevaca, in the Valley of Mexico, and on the plains of Puebla we were constantly in sight of the great snow-crowned volcanoes which form the most inspiring views in Mexico. A vivid memory of these giant mountains lingered with us long after the rainy season arrived and caused us to return to the United States.

Photo by Scott

Lizard Carved in Relief on Rock, Prehistoric, Cuernavaca

BUILDING THE ALASKAN TELEGRAPH SYSTEM

By Captain William Mitchell, U. S. Army,

Of the United States Signal Corps

Under the personal direction of General A. W. Greely, U. S. Army, the United States Signal Corps has recently laid the submarine cable connecting Sitka and Seattle, thus completing the Alaskan Telegraph system of 2,500 miles. Fort St Michael, Valdez, and points on the Yukon and Tanana rivers are now in direct telegraphic communication with the world. Some of the fearful natural difficulties that were met and conquered in the frozen wilderness of Alaska by the Signal Corps officers and men are described by Captain Mitchell in the following article.

TO one unfamiliar with conditions in Alaska it is hard to give an idea of the difficulties of travel and the hardships which have to be encountered in constructing a telegraph line through that vast and little-known country. Suffice it to say that Alaska contains one of the greatest rivers in the world, the Yukon, navigable for 2,200 miles, though frozen over during 8 months of the year, and the highest range of mountains in North America, culminating in Mt McKinley, which is over 20,000 feet high. The weather varies in temperature from 100° in the summer to lower than 70° below zero in the winter, and to add to the discomfort of summer travel the mosquitoes are a terrible pest. The snowfall varies from 60 feet along portions of the coast to 4 feet in the remote quarters of the interior, and in the entire territory there is no road which is good enough for wagons to travel, and the trails in winter must be broken through the snow which covers the ice on the rivers or the rough and rugged land on the mountain sides.

It is an extremely healthful country and very rich in game and minerals. Except along the Yukon and the coast few white men can be found, the only inhabitants being the Indians, the last vestiges of once powerful tribes, who before consisted of thousands, but now are fast disappearing. It is a country of vast distances (in round numbers being about 1,400 by 2,000 miles in extreme breadth and length, respectively), yet with all its drawbacks and hardships its strange fascination appeals to one who enjoys adventure.

In the summer of 1902, when the lines between Fort Egbert and Fort Liscum had been finished by Captain G. C. Burnell working from the south, and myself working from the north, preparations were made at Fort Egbert for the final work, namely, the joining of some point on the Fort Egbert-Fort Liscum line to the line from Saint Michaels and Nome, the extreme western towns in northern Alaska, which Captain (then Lieutenant) G. S. Gibbs had succeeded in constructing up the lower Tanana River. This work, when completed, would put the above-mentioned places in communication with the outside world, from which they had been shut out before for more than five months of the year. All stores and equipment of special make for the work, special sleds, harnesses, and transport animals—dogs, horses, and mules were sent to Fort Egbert. As practically nothing was known of the country between Fort Egbert and the lower Tanana River, reconnoissances were

made across to the Tanana and then down the Tanana for some 500 miles by boat, it being impossible to go directly through the country in question during the summer, as supplies sufficient for man and beast could not be carried. From these expeditions it was found that a northern tributary of the Tanana, known as the Goodpasture River, ran in the desired direction, as the divides or watersheds were observed to take a certain course. The source of this same river had been previously located, and by having been to both its head and mouth its general direction was fairly well established. When I returned to Fort Egbert in September of 1902, this was the sum of the information gained as to the course of the line.

As the winter was near at hand, when our utmost efforts would be necessary to make the proposed line a reality, no time was to be lost, since the line must be completed by June 30, 1903. Accordingly the transportation was organized into different trains, the dogs were picked out and matched into teams, and work was begun on the trail which the transport animals were to follow as soon as the country should freeze. The distance of the freighting line to the point where the work was to begin on the telegraph line was estimated, and a system for building stables for the horses and caches every fifteen miles was inaugurated. The men set to work on the trail during the last of September. Portions of the trail running through deep canyons were blasted out with dynamite; in other places bridges were built over warm-water springs in the creek beds, and at the requisite distances stables and caches were constructed of logs. These caches were connected with each other by wire laid on the ground and worked over by the Signal Corps buzzer instruments. In places where the ground was frozen to a great depth, making it of great electric resistance, it was necessary to build fires on the ground to thaw it, to make it possible to get a ground connection to use the buzzers.

During the first part of November I started out with Scout De Hous and our two dog teams to find out if the streams were fit for travel. We proceeded for about one hundred miles, breaking our trail with snowshoes over ice so thin that we broke through it frequently into water so deep that we were immersed to our shoulders, and the dogs were forced to swim. As the temperature was about 20° below zero at that time, great care had to be taken that we did not freeze, and as soon as we felt the cold working into us a fire was built and our clothing dried. Upon our return it was decided that the creeks were in an unfit condition for travel, and that we must accordingly wait for colder weather in spite of the delay thus caused. On November 25 the temperature dropped to 55° below zero, freezing the country tight, and through the gloom of the Arctic winter day the heavily laden sleds, the horses covered with rising steam, and the men muffled in their parkas and furs, started on their mission The trail was broken with snowshoes ahead of them, staked with brush, propped with logs, and made fit for the sleds to travel over. At first oats, hay, and rations were relayed out, and then the wire and line materials. When it was seen that the transportation was going forward satisfactorily—for this is always the greatest problem in any new country, and especially in an Arctic region—we set to work to exactly establish the course of the new line. As no white man nor Indian could be found who knew the course of the Goodpasture River, I obtained the services of an Indian, Chief Joseph of the Middle Fork tribe, who knew the best way of reaching its source.

On December 2 Scout De Hous and

myself, with our teams of seven and eight picked dogs, respectively, left Fort Egbert, accompanied by three horses and sleds carrying our rations and dog food, which were to go with us as far as possible for them. On the way out we picked up the Indian Joseph, and after some preliminary reconnoissance work to determine a good pass on the head of the Goodpasture, we reached the source of that river on December 19. There we sent back the horses, changed our dog sleds for toboggans, and made a cache on poles about 12 feet from the ground, so that the wolves and wolverines could not reach the provisions which we stored there to use on our way back. After loading our toboggans with 600 pounds each, we started, Indian Joe and I preceding the dogs, breaking the trail, and chopping out brush, while Scout De Hous managed the teams, following in our tracks. We started each morning as soon as there was sufficient light and traveled for eight hours steadily, averaging, with stops, about two miles an hour. At numerous points in the Goodpasture warm springs are prevalent, the water coming out at a temperature of 60° above zero, and many of these places had only a thin skim of ice over them. As they were covered with snow, it was often impossible to discover them as we ran along, until one or all of us would fall through into the water, and as the temperature was constantly falling, great care had to be taken to prevent freezing. At the end of the day's trip camp would be made and a fire blazing within ten minutes after we stopped. A place would be chosen near some dry spruce timber, the Indian would shovel a place in the snow with his snowshoes for the tent, get spruce boughs for the beds, and put up the tent and stove. Scout De Hous would chop the firewood and I attend to the unharnessing of the dogs and getting out our equipment from the toboggans.

By December 29 the temperature had fallen to 70° below zero, and it was almost impossible to keep our feet from freezing on the snowshoes, but we pushed ahead in an attempt to make an Indian settlement which we knew to be at the mouth of the Goodpasture. During the afternoon of December 29 I observed that Scout De Hous was lagging behind, and upon asking him what the matter was I found that he was in the stupor which always precedes freezing. As when a man is in that condition it only takes a moment for him to freeze to death, I halted and set the Indian to pulling down some dry spruce boughs for a fire, while I kept De Hous moving. Within two minutes we had the fire going, and when De Hous saw it he became distracted and jumped into the middle of it, badly burning himself, his moccasins, and clothing. It was then necessary to camp. I merely give this as an instance of what frequently happens in the Arctic, and of the care that has to be exercised to guard against being frozen to death. Only a few days before we left Fort Egbert, Scout De Hous brought in on his sled a prospector who had been careless and who had been frozen to death.

On January 1, 1903, we at last reached the mouth of the Goodpasture River, where it empties into the Tanana, and walked into a warm Indian cabin. Our hopes had been realized; an excellent course for the line had been found, and, as far as we could learn, we were the first white men to traverse the length of the Goodpasture. The Indians said they were starving, and begged, as is their custom. We gave them half of our tea, which was not much, and kept guard over the rest of our scanty store of provisions. These Indians are held in bad repute by the other Indians and white men, the white men saying that they are thieves and the Indians that they are "bad medicine men." We remained with them for one day, and then turned back. As our loads were much

lighter than when we started, we were able to make better time than on the way out, and we made as quick time as we could, as we were running short of provisions. The first day out we ran across a few Indians who did not belong to the same tribe as those at the mouth of the Goodpasture River, and who had been driven away from the Tanana, where salmon could be caught. They were without food, and had been keeping alive by boiling their moose-hide moccasins and drinking the "soup," as they called it. Their dogs were nearly all dead, and as we sat talking to them one of the dogs tottered up to the fire, fell into it, and died. The weather was so cold that with their poor equipment they could not hunt, so we gave them all the rice and dried salmon we could spare, and, as we afterward found out upon meeting them again, saved their lives by giving them the food. Had white men been driven to the extremities that these Indians were they probably could not have lived.

The day after meeting the starving Indians a peculiar incident happened, which illustrates the superstitious side of the Indian character. We had run 50 miles in two days after leaving the Tanana, and Scout De Hous and Indian Joseph had become a little sore from the excessive exercise, especially as we could not snowshoe for more than 8 hours, due to the short days, and hence were obliged to push on at as great a speed as we could. The dogs also had become a little sore, due to frost-bitten feet from traveling on the snowshoe trail in the extremely cold weather. The Tanana Indians had said something to Chief Joseph about giving too much help to the "Soldier Chief," and as he believed that they were great medicine men Joseph thought that he had been put under their spell and would never return to his wife and children alive. He was very gloomy and silent and was loosing heart in the face of the hard trip. So in order to counteract the influence of the medicine men I made medicine for him, and gave him a dose of salt and dried salmon mixed with a little of Perry Davis' pain-killer, which we were in the habit of using for frost bites. At the conclusion of the accompanying exercise and after tasting the fiery concoction Joseph was thoroughly cured, and he afterward assured me that I had saved his life. The strong belief of the Indians in the powers of their shamans is remarkable.

On the sixth day we reached our "grub cache" on the head of the Goodpasture River, having subsisted for the last four days on rice and dried salmon, and having covered 150 miles on snowshoes during that time. At the cache, where Summit Station is now located, we changed our toboggans for sleds again, went over the pass, and found that the transportation outfits had worked their way to nearly that point, which was a pleasant prospect after our six weeks on the trail.

The mass of supplies, amounting to about 300 tons, was put at the head of the Goodpasture, and the work was begun in both directions from Summit Station, a party also being started from Kelchemstock, the point selected for the joining of the Fort Egbert-Fort Liscum line with the Lower Yukon and Nome line.

The system found best to be employed was as follows: First the line was surveyed, next the right of way was chopped, then the wire was run over the snow, insulators, brackets, and nails being tied to the wire every quarter of a mile in sufficient quantities for the intervening distance. This was done because during the summer the pack animals can not pack the wire and move camps in the same manner that they can in the winter. In summer an animal can pack about 200 pounds, and in winter the same animal can pull on a sled from 800 to 2,000 pounds. It is also almost impossible to dig post-holes through the deep snow in winter. As the wire was

laid communication was kept up over it with the Signal Corps buzzer. By the last of April the wire had been run for the entire distance from Kelchemstock to the mouth of the Goodpasture. At this point we had expected to meet the party working up the Tanana, but due to unsurmountable obstacles it had not been able to get within 65 miles of that point. As I had kept in touch with the party down the Tanana, sufficient material had been put on the Goodpasture in the event that they did not reach the point of junction. Boats were accordingly built of whip-sawed lumber at Central, and as soon as the Goodpasture broke we loaded our outfit and went to the Tanana, also sending a pack train over the hills to coöperate with us on that stream, the aparajos and packing outfits having been previously sent to the Goodpasture on sleds. Meanwhile, parties with their pack trains were working between the various stations, putting in poles and elevating the wire. All stations had been chosen and caches of rations for the working parties, forage for the animals, and a year's supply for three men and one dog team, which was to form the detachment at each telegraph station, had been carried to each cache.

The final run down the Tanana started on May 31, it being necessary to reach Salcha before June 30, as the appropriation for the work ran out at that time. This was a distance of 65 miles from the end of our line to where the other party was working at that time. The work went forward rapidly, every man doing his utmost in spite of the obstacles which presented themselves. Our meat ran out, but we obtained caribou and bear meat. The mosquitoes in the Tanana swamps were nearly intolerable for both the men and the animals, it being necessary to build long smoky fires to keep them away. The animals, especially the horses, would have to be driven away from these fires to make them feed. Great care had to be taken to get the boats safely through Bates Rapids on the Tanana, because if the boats were capsized and the rations and equipment lost the completion of the line would have been delayed for a year. I accordingly took the boats through the difficult places personally, and nothing was lost. One boat had been previously capsized on the Goodpasture and over a ton of rations sunk, which was a serious thing, as no more could be obtained until winter again set in, due to the impossibility of packing for such a distance from Fort Egbert during the summer. We worked steadily on, however, gradually overcoming the obstacles in our way. When one-half the distance between Goodpasture and Salcha was completed, a forest fire caused by Indians and prospectors began to creep up the Tanana, and by June 10 was over 250 miles long, following the north bank of the river, and directly in our path. From that time until the completion of the line the men worked directly through the fire, in some places the wire being taken through the smoking embers by a man riding at a gallop on a mule.

On June 27, 1903, we made the final connection, and the Alaskan telegraph system was completed, comprising, with all the lines in the territory, nearly 2,000 miles of wire.

As General Greely, the Chief Signal Officer of the Army, has said: "Never have enlisted men shown greater aptitude and attention to duty than in the construction of these lines through the extreme cold and snow of the winters and the bogs, morasses, woods, and mosquitoes of the summer time, and with these conditions prevailing in an extremely rough and little-known country, which many people believed to be impossible for a telegraph line to be put in." As it was, the work could not have been accomplished had not the Chief Signal Officer, General Greely, directing and knowing each detail of the work, given the men engaged in it the support and encouragement which he did.

THE FISHERIES OF JAPAN

By Hugh M. Smith, of the Bureau of Fisheries*

JAPAN is today the leading fishing nation in the world. Probably in no other country has the sea played a greater part in the material and sentimental development of a people. With only a limited area available for agriculture, fish early became a great food staple. Every day in the year every Japanese family has some form of fish food. As conducted by the Japanese, fishing is more than an industry—it is a fine art. Centuries ago Japanese fisheries had attained great importance. Some of their fishing literature goes back a thousand years.

For weeks at a time I was away from towns which possessed a European hotel, and I lived at Japanese inns in strictly native style, sleeping on the floor, receiving callers while kneeling on the floor, and eating while sitting cross-legged before miniature tables, my wants supplied by more polite waitresses than one ever meets in any other land. A typical Japanese meal abounds in products of the water, and is replete with surprises to the unsophisticated foreigner. This is particularly true of the smaller fishing villages, where I passed many days.

When it comes to eating water products, the Japanese have few prejudices. If they discard any species of fish, these must be very few indeed, and I did not learn of any. Among their commonest, cheapest, and most wholesome food fishes are sharks, which are brought into the markets and butchered much after the manner of beeves in our own country. Raw fish is one of the national foods. I acknowledge that my repugnance to it was great, but was overcome by the first dish, for, as prepared and served by the Japanese, the thin, cold, boneless slices of perfectly fresh mackerel, taken with chop sticks and dipped in, say bean sauce, are delicious.

Other articles which I have eaten at a single full course are fish, soup, fried fish, baked fish, fried eels and rice, pickled eggs of sea urchins, dry octopus or squid, boiled abalone, see-weed jelly, and shredded whale cartilage pickled.

For some reason we do not knowingly eat sharks, and in this we miss a good deal. As some people are doubtless aware, the dogfish, which appear in such immense droves on our east coast and are so destructive of other fish life, are excellent when fresh or canned, and I predict that the day will come when these and other sharks will be regularly seen in our markets

In asserting that Japan is the leading fishing nation, I am, of course, aware that its fisheries are exceeded in value by those of two or three other countries, but Japan is preëminent in the actual number of people making a livelihood in this way; in the proportion of persons engaged in fishing of the total population; in the relative importance of fishing products in the domestic economy; in the ingenuity and skill shown by the people in devising fishing appliances and in preparing fishing products; in the extent to which all kinds of water products are utilized; in the zeal displayed by the government in promoting the interests of the fishing population.

The annual value of the water products is now about $30,000,000. The fishing vessels and boats number nearly 500,000, of which about 18,000 are more than 30 feet long and 85,000 more exceed 18 feet. One-twentieth of the entire population are fishermen. The latest figures available give 940,000 professionals and 1,400,000 who devote a part

* Courtesy of Boston *Evening Transcript.*

of their time to fishing and the rest to agriculture or other pursuits, a total of 2,340,000 as against 150,000 in the United States.

The factors which underlie Japan's dependence on fish are varied. The ingenuity and industry of the race, and the spirit of frugality which compels the saving of every product of the water, are prominent. Geographical features have been potent in developing the fisheries, the numerous islands and the great length of the coast line bringing a large part of the population within easy reach of the sea. There are few places in the entire empire where fresh fish may not be had daily, and this, too, without the aid of railroads or ice. This extension of the empire diagonally through 35 degrees of latitude and 38 degrees of longitude is accompanied by a wonderful variety of water life. One thousand species of fishes are already known, and the other classes of sea life are correspondingly well represented. To all of this is to be added a great abundance of most useful products, some peculiar to the inshore waters, and other high-sea species which come close to the coast in immense schools and are perpetually renewed, owing to the presence of water several thousand fathoms deep within a few miles of the mainland.

To the attitude of the government must be attributed no small share in the development of the fisheries. Since the restoration the control of the industry has been vested largely in the central government, and everything has been done that the most enlightened civilization could require to promote the welfare of the fishermen and the growth of their business. With characteristic progressiveness, officials have been sent to America and other countries to study fishing and fish culture, and the best methods of foreign lands have been adopted by the Japanese, as far as applicable to local conditions. The Imperial Fisheries Bureau, a branch of the Department of Agriculture and Commerce, is splendidly organized and ably administered by specialists in biology, fish culture, economic fisheries. The work is conducted on modern lines, with great stress laid on scientific investigation as the basis of fishery legislation and promotion.

The imperial government and the various local governments fully appreciate the importance of experimental and biological stations, and many of these have been established and are now doing excellent work. Most of the stations or laboratories are completely equipped with canning apparatus, and experiments are constantly in progress to develop methods of preserving all kinds of fish products to better advantage than now.

An institution to which the Japanese can point with great pride is the Imperial Fisheries Institute, in the outskirts of Tokyo, on Tokyo Bay. I gave a talk before the faculty and students of the institute on our fishery work in the United States. After I had been shown about the place and seen something of the equipment and methods, I was completely overwhelmed and had no hesitation in announcing that no other country possessed an institution which could compare with this one in comprehensiveness of curriculum, thoroughness of instruction, and completeness of equipment. The plant covers nearly nine acres, of which the dock occupies one and a half acres and the buildings more than two acres. The work extends through three years and comprises three courses, any one of which may be selected for special study by students in their third year, each course occupying ten full months.

The department of fishing includes the following subjects in its regular curriculum: Methods of fishing, navigation, seamanship, shipbuilding, meteorology, oceanography, applied mechanics, applied zoölogy, applied botany,

mathematics, law, economics, book-keeping, elementary fisheries, technology, and English. The department of fisheries technology has special instruction in marine food products, marine industrial products, bacteriology, applied mechanics, industrial chemistry, chemical mechanics, applied zoölogy, applied botany, law, economics, book-keeping, and English. In the department of pisciculture the subjects are fresh-water culture, salt-water culture, protection of fish, embryology, bacteriology, oceanography, chemistry, applied zoölogy, applied botany, law, economics, book-keeping, and English. Provision is made for postgraduate investigations and for various special technical inquiries. The institute has an annual income from the government amounting to $70,000. Its numerous graduates obtain excellent positions as directors of fishing, fish curing, and fishcultural establishments. The Japanese Fisheries Society deserves mention. It was organized about twenty-five years ago, and has done excellent work directly and in coöperation with the government. It publishes a monthly journal, and has 4,979 members.

While the Japanese high-sea fisheries (cod, whales, halibut, fur seals) are important, as are the river and lake resources, it is the shore fisheries alone that give to Japan its unique position as a fishing nation.

Of the most valuable products, many are identical with ours. The principal difference in the fisheries of the two countries is the relative extent to which particular species are utilized. Herring is the king of fishes in Japan, just as it is in some European countries and in the world, considered as a whole. This fish is worth $4,000,000 yearly to the Japanese, and is particularly abundant in the northern provinces. Next in importance comes the sardine, valued at $3,700,000; it is extensively canned, and is also eaten fresh and sun dried. Their bonito, very similar to ours, ranks third in value, the annual sales being $2,000,000. It is prepared in a peculiar way, and is always kept on hand as an emergency ration in Japanese houses. A fish similar to our scup or red snapper, and known as "tai," is the favorite for fresh consumption, and is worth about $2,000,000 yearly. Other prominent products are mackerel, valued at $1,000,000; tunny or horse mackerel, $900,000; amber fish or yellow tail, $1,000,000; squid and cuttle fish, $1,500,000; anchovies, $800,000; prawn, $700,000, and salmon, $600,000.

The Japanese have no fisheries comparable with our shad, alewife, menhaden, striped bass, white fish, pike, perch, lake trout, soft crabs, sponge, and lobster. Their oyster and clam fisheries are insignificant by comparison with ours, and so, too, are their salmon, mullet, cod, and halibut. On the other hand, our herrings, sardine, anchovy, yellow tail, tunny, squid, prawn, abalone, shark, and bonito and seaweed fisheries are trivial compared with theirs, and we have no cuttle fish, sea cucumber, or coral fisheries. The recent growth of the Japanese coral industry has been marked, and the Mediterranean corals, which for centuries have monopolized the world's markets, have already taken second place. Much of the Italian output of coral ornaments is now made from imported Japanese raw products.

WHAT THE U. S. GEOLOGICAL SURVEY HAS DONE IN TWENTY-FIVE YEARS

IN commemoration of the twenty-fifth anniversary of the formation of the U. S. Geological Survey, the Survey has published a small volume giving an account of the origin, development, and present organization of the Survey, with short summaries of its various operations during the first quarter century of its existence. Among the more important results achieved by the organization are the following :

A complete topographic map of 929,850 square miles of the area of the United States, which, including Alaska, amounts to 3,622,933 square miles. In other words, the Survey has finished the mapping, on more or less detailed scales, of 26 per cent of the area of the country including Alaska, and 31 per cent excluding Alaska.

This map is published in the form of 1,327 separate atlas sheets, printed in three colors from copper-plate engravings. The topographic maps of the Geological Survey have greatly expedited investigations by cities of their water supply, and have been of the highest value to railway companies and state highway bureaus in designing and planning their projects. The improvement of highways in New York, Maryland, Massachusetts, and other states has been greatly facilitated and the cost of the state work materially reduced by these maps. The elaborate and valuable reports recently completed on the future water supply of the city of New York and on the New York State Barge Canal have been rendered conclusive in large measure only through the agency of the existing topographic maps.

Many of the broader problems whose solution must necessarily precede the final geologic mapping of the country have been solved. The geologic mapping of the surface formations has been extended over about 171,000 square miles, and 106 geologic folios have been published, while nearly an equal number are in various stages of preparation. These folios consist of descriptive text, a topographic sheet, geologic sheets for areal and economic geology, structure sections, columnar sections, etc. Each folio thus presents a practically complete history of the topography, geology, and mineral resources of the area described.

Coincident with the geologic work, important experiments and investigations into the physical characteristics of rocks in various processes of formation, and of volcanic and geyser action, have been conducted in the physical laboratory, and many important conclusions have been reached. The chemical laboratory and the petrographic laboratory have been engaged in solving, chemically and microscopically, the more important problems connected with rock composition and structure, while the paleontologic section has aided in solving stratigraphic and structural problems by the classification and identification of the fossil remains of plants and animals.

The engraving and printing division has engraved 1,421 series of copper plates for as many topographic atlas sheets, each series consisting of three plates, one for each color. It has lithographed on stone the colors, ranging in number from 10 to nearly 30, necessary for distinguishing in each of about 100 geologic folios the various formations and outcrops. It has printed several editions of most of the topographic maps and at least one edition of the geologic folios, besides revising both as occasion therefor has arisen, and engraving and printing miscellaneous state and United States maps.

The hydrographic branch, including the reclamation service, has recorded during the last 15 years the maximum, minimum, and mean discharges of all the more important rivers, and for

shorter periods the same facts concerning all the lesser tributaries of the many hundreds of streams in the United States. These results have been assembled and studied, and the flow of the streams has been compared with the precipitation as shown by the records of the Weather Bureau. The physical characteristics of the river basins have been studied in respect to their forestation, soil covering, etc., and there has been accumulated a vast amount of data from which it is possible to estimate closely the volume or run-off of each of the streams. The development of the water powers of the country, especially in the Southern States, has received a great impetus in the last few years through the facts brought to light by the hydrographic branch in respect to the volume and regularity of the discharge of and the amount of fall in the various streams of the country. Many unknown water powers have been found, and projects already commenced have had their value or their defects made manifest through the evidence resulting from the surveys of this branch. Data have been gathered concerning the public lands which are irrigable and their relation to possible water supplies. A large number of reservoir sites have been examined and surveyed in a preliminary way, and the lands withdrawn from sale or occupation pending more detailed studies. A number of these reservoir and irrigation projects have been studied in greater detail, surveys of the irrigable lands, as well as of canal lines, have been made, and some have been finally approved for construction by the reclamation service.

The division of geography and forestry has made detailed examinations of 110,000 square miles, including a classification of the lands, as forested (with stand and kind of timber), grazing, desert, and cultivable, and has prepared final reports on these reserves, showing the character and amount of the timber and many other facts which will serve as a basis for the future forest management of these properties.

Perhaps the immediate value to the people of the work of the Geological Survey is best shown by the aid it extends in developing the mineral resources and in forwarding important engineering projects in which the people, as well as the state and federal governments, are interested. To instance a few cases: The work of the geologic branch has had a wide educational influence upon the public at large, but more directly upon those engaged in the mining industry. Among the many direct practical benefits which it has conferred upon this industry may be mentioned the investigation of the mining geology of Leadville, which has not only guided exploration and secured economical mining in a district that has produced between $200,000,000 and $300,000,000, but has been of even more beneficial result in teaching the mining engineer and the miner the practical importance of geologic study in carrying on the work. In other words, it has greatly improved mining methods throughout the whole country. The investigation of the origin and geologic relations of the Lake Superior iron ores and the publication of numerous reports on that region have so effectively directed the prospector in the discovery of the deposits and the miner in economical methods of development that this region now leads the world in the production of iron ore. The detailed areal mapping and the determination of underground structure in the Appalachian coal fields are placing the development of its coal, petroleum, and gas resources upon a scientific basis and relieving these branches of the mineral industry of a large part of the hazard and uncertainty which has always hitherto been associated with them. The collection and publication of reliable statistics of mineral production have furnished a sound commercial basis for all branches of the mineral industry.

COLOSSAL NATURAL BRIDGES OF UTAH

THREE gigantic bridges, greatly surpassing the great Natural Bridge of Virginia, have recently been discovered at the head of White Canyon, in San Juan county, Utah. They are described in the *Century Magazine* for August by W. W. Dyar, and the magazine also publishes several photographs of them and a remarkable colored picture of the largest bridge. The bridges are many miles from the railway, and, it is said, can be reached only during the spring of the year, as lack of water makes the region inaccessible except during the early months. In March, 1903, Mr Horace J. Long, a mining engineer, conducted by a cattleman named Scorup, who had caught a distant glimpse of the bridges in 1895 and had desired to examine them ever since, entered White Canyon at a point two days' march from Dandy Crossing, on the Colorado River. They ascended the canyon for several miles, passing numerous ancient cliff dwellings, until they had their first sight of the first of the great bridges.

"The travelers had with them no scientific instruments for making accurate measurements, but by a series of rough triangulations Long obtained results which are doubtless correct within narrow limits. The first bridge, which they named the Caroline (in honor of Mr Scorup's wife), measures two hundred and eight feet six inches from buttress to buttress across the bottom of the canyon. From the surface of the water to the center of the arch above is a sheer height of one hundred and ninety-seven feet, and over the arch at its highest point the solid mass of sandstone rises one hundred and twenty-five feet farther to the level floor of the bridge. A traveler crossing the canyon by this titanic masonry would thus pass three hundred and twenty-two feet above the bed of the stream. The floor of the bridge is one hundred and twenty-seven feet wide, so that an army could march over it in columns of companies, and still leave room at the side for a continuous stream of artillery and baggage wagons."

The second bridge is about 3½ miles farther up the canyon. Its "height is more than twice and its span more than three times as great as those of the famous Natural Bridge of Virginia. Its buttresses are 118 feet farther apart than those of the celebrated masonry arch in Maryland, known as Cabin John Bridge, a few miles from Washington city, which has the greatest span of any masonry bridge on this continent. This bridge would overspan the Capitol at Washington, and clear the top of the dome by 51 feet; and if the loftiest tree in the Calaveras grove of giant sequoia in California stood in the bottom of the canyon, its topmost bough would lack 32 feet of reaching the under side of the arch.

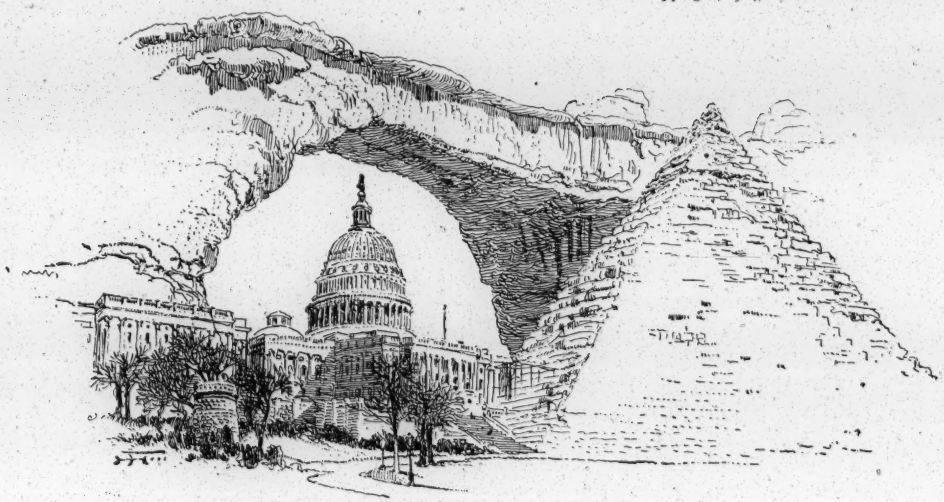
"Emulating the example of Mr Scorup, Long named this bridge the "Augusta," in honor of his wife, and it is fortunate that the lady was so appropriately christened.

"This bridge is of white or very light sandstone, and, as in the case of the Caroline, filaments of green and orange-tinted lichens run here and there over the mighty buttresses and along the sheltered crevices under the lofty cornice, giving warmth and color to the wonderful picture.

"Our explorers were unable to scale the walls of the canyon in the immediate neighborhood of either of these two bridges, and their time was too limited to permit an extended search for a ravine or wash that would lead them to the top of the cliffs."

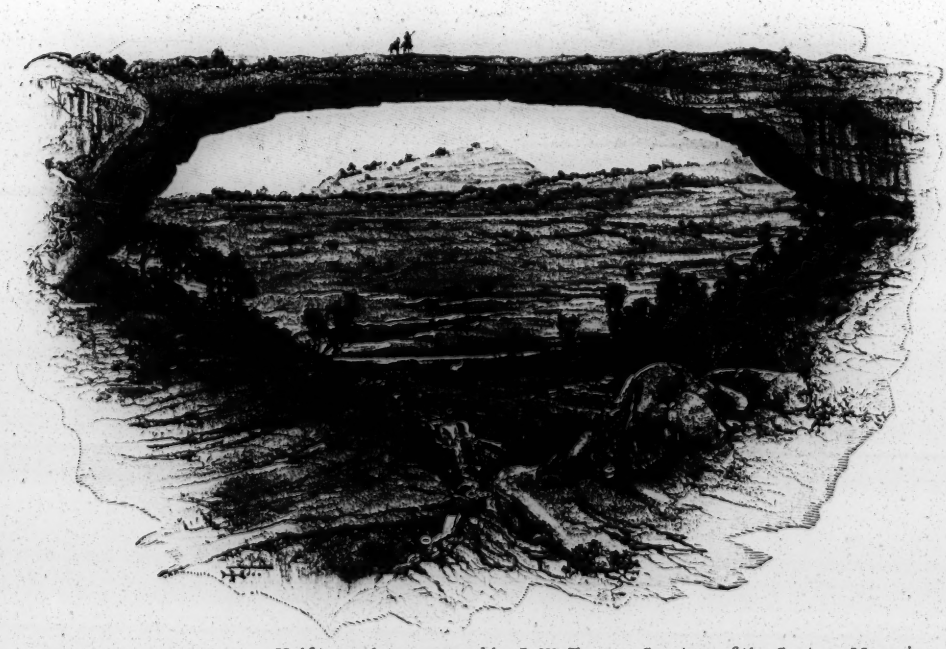
About 12 miles down the canyon is the third bridge. "Long, in his rough notes of the trip, calls this the 'Little Bridge,' and we may well retain this

Copyright, 1904, THE CENTURY CO.



The Augusta Natural Bridge (see page 367), Compared with the Capitol at Washington and the Great Pyramid.

Copyright, 1904, THE CENTURY CO.



Half-tone plate engraved by J. W. Evans. Courtesy of the Century Magazine

The Little Bridge

designation. Its dimensions, however, are small only as compared with the gigantic proportions of the Caroline and the Augusta, for it has a span of 211 feet 4 inches, and the under side of the arch is 142 feet above the bottom of the canyon. The crown of the arch is 18 feet 8 inches thick, and the surface or roadway 33 feet 5 inches wide. The slenderness of this aerial pathway and the fact that the canyon here opens out into a sloping valley beyond rendered it possible for the camera to give a proper impression of loftiness. Indeed, judging from the photographs alone, one might suppose this to be the highest of the three bridges, whereas in fact it has but little more than one-third the altitude of the wonderful Augusta arch. It was comparatively easy to reach the top of this bridge, and among Long's notes I find the following: 'Rode our horses over. I am the first white man who has ever ridden over this bridge.' "

GAZETTEERS OF THE STATES

A SERIES of useful gazetteers of the different states is being published by the U. S. Geological Survey. Within the past month there have appeared four bulletins in the series—gazetteers of Virginia, Maryland, Delaware, and Texas—each prepared by Mr. Henry Gannett. Each bulletin, handsomely illustrated, gives a brief description of every geographical feature in the state, and, as an introductory chapter, a general description of the state.

Virginia was one of the first states of the Union to be settled. At the time of the first census, taken in 1790, it had a population of nearly three-fourths of a million and was the most densely inhabited of all the states. In 1900, with a population of 1,854,184, it was the seventeenth state in number of inhabitants. Of the total population, only 14.6 per cent were found in cities and the remaining 85.4 per cent were classed as rural. This proportion of rural population is much greater than that of the country at large. Another interesting fact in connection with the population is the statement that the white race increased in the decade between 1890 and 1900 at the rate of 16.9 per cent, while the negroes increased at the rate of only 4 per cent. This small rate of increase among the negroes is certainly not due to any falling off in natural increase, but indicates a movement of the negro population away from the state, probably southward.

Virginia is preëminently an agricultural state. The total area of farms in 1900 was 19,907,883 acres, but the average size of the farms was only 118.6 acres, which is considerably less than the size of the average farm of the United States. Tobacco is the most important of Virginia's agricultural products. Kentucky and North Carolina are the only states that exceed Virginia in the production of that important weed.

As a manufacturing state, Virginia does not take high rank; but in view of her rich deposits of excellent coking coal and iron it is probable that her manufactures will greatly increase. The coal production in 1901 was 2,725,873 short tons, and the amount of coke produced was 907,130 short tons. In that same year 448,662 long tons of pig iron were smelted within the state. Manganese ore to the amount of 4,275 tons was mined.

Maryland was one of the thirteen original states, and has the distinction of having ceded to the general government, as the site of a capital, an area of

about 70 square miles, which constitutes the present District of Columbia.

In 1730 Maryland was the sixth state in the Union in population. In 1900, although its inhabitants were 3.7 times as numerous, it had dropped to the twenty sixth in rank. This was due to the rapid growth of the newer states in the Mississippi Valley. It now has five cities which exceed 6,000 inhabitants. Baltimore has over half a million ; Cumberland, 17,128 ; Hagerstown, 13,591 ; Frederick, 9,296, and Annapolis, the capital, 8,525. These five cities contain 46.9 per cent of the population of the entire state, which amounted to 1,188,044 in 1900. This population is divided almost equally between males and females. The negro population, which constitutes about one-fifth of the whole, is diminishing in proportion to the whites. The number of foreign-born inhabitants is also small, the persons of native birth forming 92.1 per cent of the entire population.

For a state containing so large a proportion of negroes, the illiteracy is slight. In 1900 persons 10 years of age and over who were unable to read and write constituted 11.1 per cent of the population.

Agriculture is one of the leading occupations. In 1900 the state contained 46,021 farms, of which seven-eighths were occupied by white farmers and one-eighth by negro farmers. The average size of the farms was 112.4 acres, which is considerable less than the average for the United States. The total value of all the farms was $204,645,407, and the product amounted to 21 per cent of the value of the farms, and may be regarded as the farming profit. In the production of tobacco Maryland is the eighth state in the Union.

In manufactures Maryland is the fourteenth state in the Union. Two-thirds of the manufactures are carried on in the city of Baltimore.

The principal and almost sole mineral product of the state is a bituminous coal of excellent quality, mined in the neighborhood of Cumberland. In 1901 the amount mined was 5,113,127 tons.

A NOTABLE NORWEGIAN PUBLICATION

THE people of Norway are one of the most interesting and unique of old Europe. Although such a small nation, numbering only 2,230,000, they hold a very important place in the world, thanks to their writers and scholars. In proportion to its inhabitants Norway has more men celebrated for their achievements than any other nation. In literature there is the poet Björnstjern Björnson and the dramatist Ibsen, whose works are admired both in America and in Europe; in the sciences the celebrated Nansen and such men as Sars, Moln, and Brögger, whose achievements specialists universally recognize.

Not only because of its famous men has this little nation won the attention of the world, but also because of its own marked individuality. The Norwegians have a wonderful spirit of initiative, resembling Americans in this respect, and they also show a very striking taste for the study and observation of natural phenomena. During the long northern winter, shut in by snow and ice, the peasants spend their time in reading, and reading especially works of science ; the naturalist who explores Norway is struck on every side by the intelligent interest shown in his researches.

The Norwegians have just shown a new proof of their love and pride in their country. A group of eminent scholars in Christiania conceived the idea of publishing a great work which should give

a faithful description of Norway and set forth the results accomplished by Norwegians in every branch of human activity since the establishment of the independent monarchy (1814). This work, "Norge I det Nittende Aarhundrede" (Norway in the XIX Century), illustrated by the best Norwegian artists, costs $16.00, a high price in a country of moderate means. The market for this Norwegian library is necessarily small, but the publication, although started with an entirely disinterested object in view, has paid for itself. From one end of the country to the other all classes of people have helped with their subscriptions to erect this literary monument to science and to the glory of their country. The Norwegian language offers little difficulty to English-speaking people, and "Norge I det Nittende Aarhundrede" deserves to be brought to the attention of American geographers as a work of highest rank. It consists of a series of very complete monographs on the geography, geology, history, ethnography, and varied industries of Norway, all edited by the most eminent specialists. The work contains a mass of facts which it would be very difficult to find anywhere else, and is one of the most important works on general geography that has appeared since the beginning of the twentieth century.

CHARLES RABOT.

Paris.

BOOKS RECEIVED

Dodge's Elementary Geography. Part 1, Home Geography; Part 2, World Relations and the Continents. By Richard Elwood Dodge. Pp. 231. 8 by 10 inches. Chicago: Rand, McNally & Co. 1904. $0.75.

Philippine Islands. By Emma Helen Blair and James Alexander Robertson. Vol. XVI. Pp. 330. 6 by 9½ inches. Cleveland, Ohio: Arthur H. Clarke Co. 1904.

The Philippine Islands. Report of the Philippine Commission for 1903. 3 vols, large octavo. Washington: Government Printing Office. 1904.

Les Lois de la Geographie. By Carlos De Mello. Pp. 360. 6 by 9½ inches. Berlin: R. Friedlander & Sohn. 1902.

Early Western Travels. 1748 to 1846. By R. G. Thwaites, LL. D. Vols. IV, V, VI. Pp. 400. 6½ by 9½ inches. Cleveland, Ohio: Arthur H. Clarke Co. 1904.

Introduction of Domestic Reindeer into Alaska. With map and illustrations. By Sheldon Jackson. Pp. 192. 6 by 9½ inches. Washington, D. C.: Government Printing Office. 1904.

North America By Israel C. Russell. Maps and diagrams. Pp. 434. 6 by 9 inches. New York: D. Appleton & Co. 1904.

Year Book of the U. S. Department of Agriculture. Illustrated. Pp. 628. 6 by 9 inches. Washington, D.C.: Government Printing Office. 1904.

Glaciers of Alaska. By George Davidson. Pp. 98. 6½ by 10 inches. San Francisco: Geographical Society of the Pacific. 1904.

RECENT GOVERNMENT REPORTS

Census of the Philippine Islands, 1903, Gen. J. P. Sanger, Director; Henry Gannett, V. H. Olmsted, Assistant Directors. Bulletin I. Population. Bulletin II. Climate, by S. J. Celqué. Bulletin III. Volcanoes and Seismic Disturbances, by M. S. Maso. Bureau of the Census.

Planting of White Pine in New England, H. B. Kempton. Bureau of Forestry.

Forest Resources of Texas, William L. Bray. Bureau of Forestry.

Forests of the Hawaiian Islands, William L. Hall. Bureau of Forestry.

The Date Palm and Its Utilization in the Southwestern States, Walter T. Swingle. Bureau of Plant Industry.

The Clays of the United States East of the Mississippi, Heinrich Ries. U. S. Geological Survey.

The Carboniferous Formations and Faunas of Colorado, George H. Girty. U. S. Geological Survey.

Turtle Mountain and the Great Rock-slide at Frank, Alta, Looking Northward

At dawn on April 29, 1903, a huge rock mass, nearly half a mile square and probably 400 to 500 feet thick in places, suddenly broke loose from the east face of Turtle Mountain and precipitated itself with terrific violence into the valley beneath, overwhelming everything in its course. The great mass, urged forward by the momentum acquired in its descent and broken into innumerable fragments, plowed through the bed of Old Man River, and, carrying both water and underlying sediments along with it, crossed the valley and hurled itself against and up the opposite terraced slopes to a height of 400 feet. Blocks of limestones and shale, mingled with mud, now cover the valley to a depth of from 3 to probably 150 feet, over an area of 1.03 square miles. A rough estimate of the size of the mass which broke away, obtained by comparison of the old and new contours of the mountain itself, is about 40,702,000 cubic yards, or 90,796,000 tons. The Frank slide was a "Bergsturz," a breaking away of the mountain mass across the bedding planes. The cavity left by the breaking away of the central peak and the course of the slide can be distinctly seen. Under the slide-rock the terraced floor of the valley is discernible. The uneven, billowed surface of the slide-rock is well shown, and the heaped-up rim along the edges of the slide can be seen at several points. In the foreground is a thin promontory of débris deflected from the main course of the slide. The town lies on the farther side of the slide in the direction of the gap between the mountains. A special report on this great slide has been recently published by the Department of Interior, at Ottawa.

PROGRAM OF

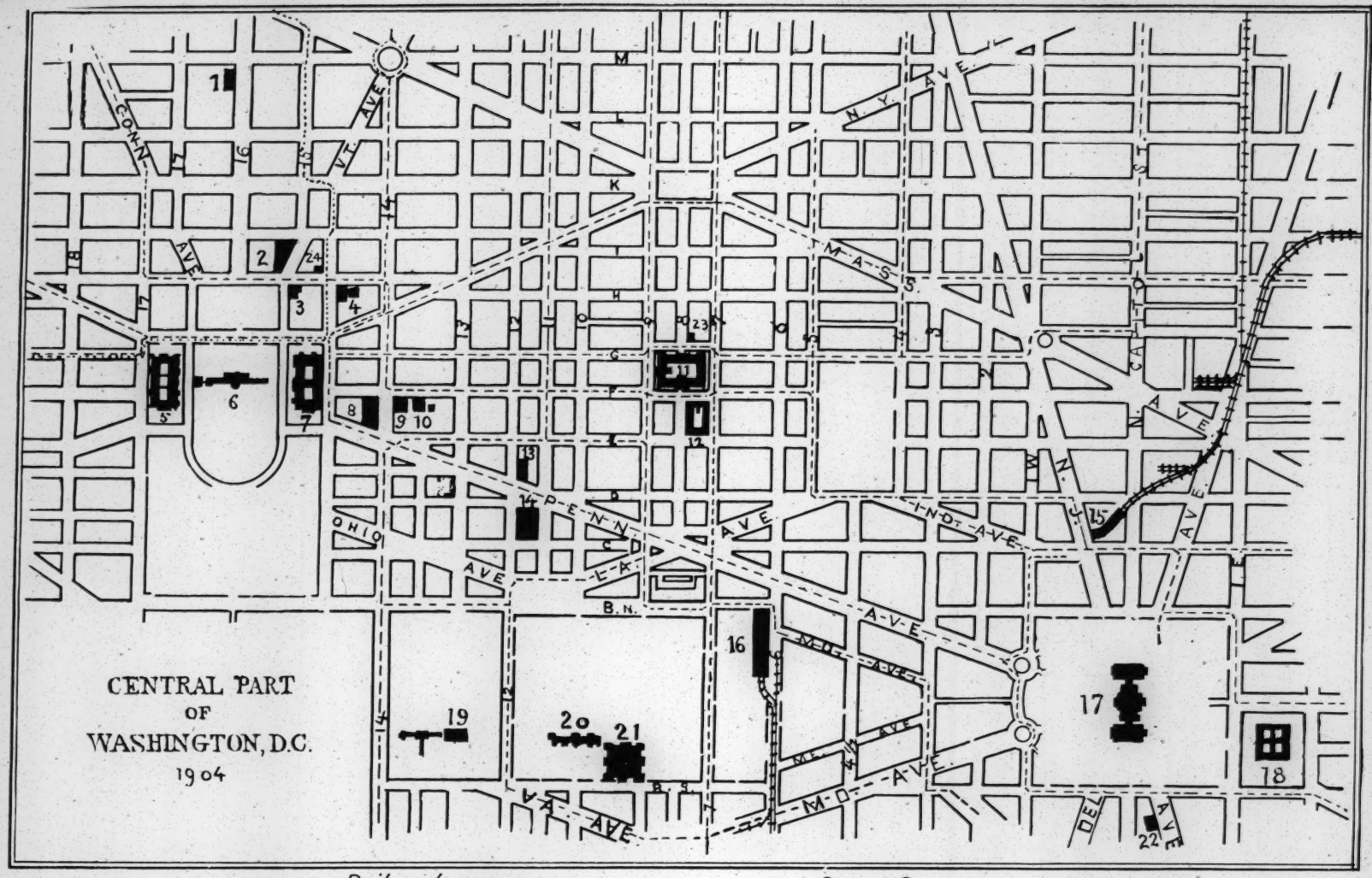
EIGHTH

International Geographic Congress

HELD AT

WASHINGTON, D. C.

6 White House
12 General Land Office
18 Library of Congress
24 Shoreham



1 Hubbard Memorial Hall
2 Arlington Hotel
3 Cosmos Club
4 George Washington (Columbian) University
5 State, War, and Navy Departments
6 White House
7 Treasury Department
8 Willard Hotel
9 Ebbitt House (Headquarters)
10 Geological Survey
11 Interior Department
12 General Land Office
13 Raleigh Hotel
14 Post Office Department
15 Baltimore and Ohio Railroad Depot
16 Pennsylvania Railroad Depot
17 Capitol
18 Library of Congress
19 Department of Agriculture
20 Smithsonian Institution
21 National Museum
22 Coast and Geodetic Survey
23 Bureau of Education
24 Shoreham

GENERAL PROGRAM OF THE EIGHTH INTERNATIONAL GEOGRAPHIC CONGRESS

WASHINGTON, D. C., THURSDAY, SEPTEMBER 8, 1904

THE Eighth International Geographic Congress will differ from all previous Congresses, in that sessions will be held in several cities instead of one, as heretofore.

The times and places of convening are as follows:

Wednesday, September 7.—Informal reception at Hubbard Memorial Hall by National Geographic Society.

Thursday September 8.—Formal opening of Congress at 10 o'clock.

Friday, September 9.—General and Sectional Meetings.

Saturday, September 10.—General and Sectional Meetings.

Sunday, September 11.—Field Meeting on Potomac River, followed by trip to Philadelphia, train leaving at 7 p. m.

Monday, September 12.—Meeting under auspices of Geographical Society of Philadelphia.

Tuesday, September 13.—Sessions in New York under auspices of American Geographical Society.

Wednesday September 14.—Sessions in New York under auspices of American Geographical Society.

Thursday, September 15.—Field Meeting on Hudson River.

Friday, September 16.—Field Meeting, Niagara Falls.

Saturday, September 17.—Sessions in Chicago under auspices of Geographic Society of Chicago.

Sunday, September 18.—Field Meeting.

Monday, September 19, to Wednesday, September 21.—Meetings in St Louis in conjunction with Congress of Arts and Sciences.

For the information of the members of the Congress visiting Washington and not acquainted with the city, a map of that portion of the city containing the places of special interest is printed on preceding page.

The accompanying information will also be of use to the visitors:

HEADQUARTERS

Until September 7 the office of the Congress will be in Hubbard Memorial Hall (the home of the National Geographic Society), corner Sixteenth and M streets northwest, Washington, D.C. (No. 1 on map). On Wednesday morning, September 7, the records will be transferred to the Ebbitt House (No. 9 on map), Fourteenth and F streets northwest. This hotel will remain the headquarters during the stay of the Congress in Washington, and the secretaries will be in constant attendance for registering members, supplying badges, furnishing information, etc.

The headquarters can be reached by street cars, which run from the depots to the Ebbitt House.

On September 12 an office for registration will be opened in the headquarters of the Geographical Society of Philadelphia, 1520 Chestnut street, Philadelphia, Pennsylvania.

On the morning of the 13th an office for registration will be opened in New York, at the American Geographical Society building, 15 West Eighty-first street, which will be the headquarters of the Congress during its stay in New York.

On September 17 a registration office will be opened in Cobb Hall of the University of Chicago, Chicago, Illinois

On the morning of September 19 a registration office will be located in the Hall of Congresses on the Exposition grounds in St. Louis. On Saturday, September 24, the records will be transferred to Hubbard Memorial Hall, Washington, where the office will be retained and whither all correspondence should be directed until the final closing of the affairs of the Eighth International Geographic Congress.

REGISTRATION

Delegates, members, associates, and persons desiring to become members are requested to register on the earliest possible date at the local headquarters in the city in which they first attend the Congress. Those who participate in the Washington sessions are especially desired promptly to record their names and local addresses in order to facilitate the preparation of lists of membership and the delivery of mail. Immediately on registering, members of the Congress will receive the official badge entitling them to the privileges of the Congress and to the courtesies extended to members by local committees.

On September 7 will be issued a list of all members registered to that date. Those marked + are present at the Congress, and their local addresses will be given. To facilitate the identification of members each one registered will be furnished a small button numbered to correspond with his membership ticket. To identify a member it is only necessary to look in the list at the name opposite the number on his button.

An alphabetic list will also be given, with the number of the ticket opposite each name, in order that members may ascertain if a particular person is a member of the Congress or is in attendance upon its sessions.

Members and delegates of foreign geographic societies are requested to see that their respective societies are registered and the cards for permanent record filled out.

HOTELS

In Washington the hotels recommended are as follows:

The Ebbitt House (headquarters), Fourteenth and F streets; American plan; $3.00 and $4.00 per day. (No. 9 on map.)

The New Willard, across the street from the Ebbitt House (headquarters), three squares south of meeting place; European plan; $2.50 per day and upward. (No. 8 on map.)

The Raleigh, Twelfth street and Pennsylvania avenue; European plan; $2.00 per day and upward. (No. 13 on map.)

The Arlington, one block west of meeting place; American plan; $5.00 per day. (No. 2 on map.)

The Shoreham, across the street from meeting place; European plan; $2.00 and $3.00 per day. (No. 24 on map.)

The Colonial, across the street from meeting place; European plan; $1.50 per day. (Opposite No. 4 on map.)

Members preferring private or boarding houses to hotels can be accommodated at reasonable rates by communicating in advance with the secretary of the Committee of Arrangements.

Each of the above hotels can be reached by street cars.

BAGGAGE

Members arriving at either the Pennsylvania or the Baltimore and Ohio station can check baggage to their hotel at the Union Transfer Company's stand, the regular fee being 25 cents for each piece.

The Union Transfer Company (telephone number, Main 1610) will call for and check baggage from hotels and residences to destination.

Members can also have their baggage delivered for a fee of 25 cents by leav-

ing their checks at the headquarters, Ebbitt House.

CAB SERVICE

The Pennsylvania Railroad operates a cab-service system, the main office being at the Pennsylvania Railroad station, Sixth and B streets northwest (telephone, main 1640). The rates follow:

By the Trip

One and a half miles or less, direct to or from station to one address, one person, 25 cents.

Each additional person, 25 cents.

Each additional address, one or two persons, 25 cents.

Each additional address, more than two persons, each person, 10 cents.

Each additional half mile or less, each person, 10 cents.

On Call, to go to Station

To call at any address within 1½ miles of Sixth Street station, one person, 25 cents.

Each additional person, 25 cents.

Each additional half mile or less, each person, 10 cents.

By the Hour

One or two persons, first hour or less, 75 cents.

Three or four persons, $1.00.

Each additional quarter hour or less, one or two persons, 20 cents.

Three or four persons, 25 cents.

STREET CARS

Street-car lines charge 5 cents within city limits, or 6 tickets for 25 cents, and free transfers are given to branch lines. If transfer to another branch is desired, ask for the transfer when the fare is paid.

Visitors desiring to see Washington can also take the "Seeing Washington Car." Tickets can be obtained at headquaters at a special rate, to members and associates of the Congress, of 40 cents for regular trips. Arrangements for special parties can be made at headquarters.

SIGHT-SEEING AUTOMOBILE

Arrangements have been made with the Auto Transit Company for personally conducted tours of the city by means of their Big Red Automobile. This auto goes direct to every point of interest, and is accompanied by a competent lecturer, who gives an accurate account of every point, historic and interesting.

This is perhaps the most comprehensive and comfortable means of seeing all the sights.

Tickets can be purchased at headquarters at 80 cents for the entire trip. This rate is for members of the Congress only.

These trips require about two hours for the round trip, and will afford the visitors a quick way of seeing the residential portion of the city.

TELEGRAPH COMPANIES

Western Union, main office, corner Fourteenth and F streets northwest, opposite headquarters.

Postal, main office, 1345 Pennsylvania avenue northwest.

MESSENGER SERVICE

The Mutual District Messenger Company, main office, 1401 F street northwest.

The Postal Telegraph Cable Company, 1345 Pennsylvania avenue northwest.

PLACES TO SEE

Bureaus of Special Geographic Interest

Geological Survey, 1330 F street.

Weather Bureau, corner of Twenty-fourth and M streets.

Plant Industry Bureau, Department of Agriculture.

Biological Survey, Department of Agriculture.

Census, corner of First and B streets northwest.

Coast and Geodetic Survey, New Jersey avenue southeast near B street.

National Museum, Mall, near Seventh street.

Smithsonian Institution, Mall, near Seventh street.

Observatory, on Georgetown Heights, north of Georgetown.

Hydrographic Office, Navy Department.

Signal Service, War Department.

Bureau of Engineers, War Department.

Information Division, War Department, Lemon Building.

Bureau of Insular Affairs, War Department.

Isthmian Canal Commission, Eleventh street and Pennsylvania avenue.

Navy Yard (gun factory), foot of Eighth street southeast.

Bureau of Forestry, Atlantic Building, 920 F street.

Fish Commission, corner of Sixth and B streets southwest.

Zoölogical Park, Connecticut avenue extended.

Botanic Gardens, First street and Pennsylvania avenue.

Bureau of Standards, New Jersey avenue southeast.

Army Medical Museum, Mall, near Seventh street.

Bureau of American Republics, corner of Jackson place and Pennsylvania avenue.

Carnegie Institution, Bond Building, corner of New York avenue and Fourteenth street.

Bureau of Education, corner of Eighth and G streets northwest.

Bureau of American Ethnology, Adams Building, 1333 F street.

Places of General Interest

Capitol.

Library of Congress.

White House.

Washington Monument.

Bureau of Engraving and Printing.

Government Printing Office.

On account of the limited time given for sightseeing in Washington provision has been made for those who desire to stop off on the return from the western excursion to see the places of interest in the city.

SHORT EXCURSIONS

Some of the most interesting short trips from the city, none consuming more than a few hours, are the following:

Mount Vernon, with the home and tomb of Washington, may be reached by steamer from the Seventh Street wharf, leaving at 10 a. m. and 1.45 p. m. and returning by 1.40 or 5.15 p. m., or by trolley cars, leaving Pennsylvania avenue and Thirteenth-and-a-half street every hour. The round trip, including admission to Mount Vernon, costs 75 cents.

Arlington National Cemetery can be reached by trolley line from Thirteenth-and-a-half street; or by the Georgetown car on Pennsylvania Avenue, across the Aqudeuct bridge, and by trolley from Roslyn.

The Soldiers' Home, a park 3 miles north of the Capitol, is reached by the Seventh or Ninth Street cars.

The National Zoölogical Park is reached by the Connecticut Avenue and Seventh Street lines.

Cabin John Bridge, one of the largest single spans of masonry in the world, 220 feet long and 100 feet above Cabin John Run, is reached by the F Street line, with connection at Georgetown.

POSTAL ARRANGEMENTS

All mail should be addressed care of the Eighth International Geographic Congress, Ebbitt House, Washington, D. C. Members can obtain their mail between 8 a. m. and 7 p. m. by applying at the registration office at headquarters.

USE OF TICKETS

Members and associates are requested to keep their tickets always ready to produce on application. Various publications, some of scientific value, which have been specially prepared for the members of the Congress, will be distributed only to those who are in possession of a ticket.

DAILY PROGRAM

Daily programs will be issued during the meetings in Washington and New York. Any matter designed for incorporation in these must be in the hands of the secretaries by 5 o'clock of the day preceding issue.

COMMUNICATIONS

Following approximately the classification of subjects announced in the preliminary circular, the following sections of the Congress will be organized, and all communications, except such as may be reserved for general sessions, will be made before one or other of these sections:

Section A. Physiography of the land.
Section B. Volcanoes and earthquakes.
Section C. Glaciers.
Section D. Oceanography.
Section E. Meteorology and terrestrial magnetism.
Section F. Bio-geography.
Section G. Anthropo-geography.
Section H. Geodesy and geographic technology.
Section I. Explorations.
Section J. Economic geography and hydrology.
Section K. Educational geography.
Section L. Historical geography.

A special opportunity will be afforded for the discussion of methods of surveying and map-making and for comparison of these methods as pursued in other countries with the work of federal and state surveys maintained in this country.

Delegates and members desiring to present communications before the Congress or wishing to propose subjects for discussion are requested to signify their wishes at the earliest practicable date. It is especially needful that any titles offered hereafter shall be accompanied by abstracts (not exceeding 300 words in length) in order that the Presidency may take prompt action toward introducing the titles and abstracts in the general program to be published at the beginning of the Congress.

The time required for presenting communications should be stated; otherwise twelve minutes will be allotted. It is anticipated that not more than twenty minutes will be allotted for any communication unless the Presidency decides to extend the time by reason of the general interest or importance of the subject.

Titles and abstracts of communications should be submitted to the Secretary of the Congress. Pending the opening of the Congress, the Committee of Arrangements shall decide whether the same are appropriate for incorporation in the program, though the decision of the committee shall be subject to revision by the Presidency after the Congress convenes.

The preliminary announcement, issued in January last, having provided that proposals affecting the organization of the Congress shall be submitted in writing before May 1, any such proposals hereafter received will be laid before the Presidency, who will determine whether they shall receive consideration at the Eighth Congress or be laid over for future action.

COMPTE RENDU

The Presidency, with the aid of a Committee on Publication, will prepare a volume of proceedings or "Compte Rendu," comprising those communications and abstracts which they deem it needful to publish, and this publication will be sent to all members of the

Congress, including societies represented by delegates.

All communications and abstracts submitted for reading or printing shall be deemed the property of the Congress and in every respect subject to the action of the Presidency, although a request for the return of any copy not approved for publication might be entertained at the option of the Presidency.

Authors of communications exceeding seven printed pages in length desiring separates shall order the same (specifying the number) in writing on their manuscript. Such separates will be furnished at cost of press-work, paper, and cover, plus a small percentage (not exceeding 25).

CONTRIBUTIONS OF MEMBERS TO THE FINAL REPORT ON THE CONGRESS

In order to accelerate the publication of the Final Report, all those who have not yet delivered the manuscripts of their papers and communications to the officers of the Congress are requested to place them in the hands of the General Secretary before the close of the meeting. It is also requested that each member who takes part in a discussion will deliver to the secretary of the appropriate section a copy or abstract of his remarks; wherever practicable, in order to avoid error, the papers and reports of discussions should be typewritten.

LANGUAGES OF THE CONGRESS

In order that the geographic societies of the New World may fully utilize the opportunity afforded by this Congress for establishing closer relations with those of the Old World, Spanish will be recognized as one of the languages of the Congress, together with French, English, German, and Italian, in accordance with previous usage. A communication before the Congress may be written in one (or more) of these languages.

THE ITINERARY OF THE CONGRESS

The general announcement contains the itinerary of the Congress and also the rates for transportation. In the daily program to be issued further details will be given concerning these matters. All desired information can be obtained from the Secretary of the Committee of Arrangements at registration headquarters.

In order to provide proper accommodations for those accompanying the Congress on its itinerary, and those participating in the general excursion to Mexico and the western part of the United States, members of the Congress are requested to obtain their tickets, from the Committee of Arrangements, at the earliest possible moment. The secretary of the committee, or his representative, will be at the headquarters, in the Ebbitt House, Wednesday, Thursday, Friday, and Saturday, from 9 a. m. to 7 p. m., for the purpose of affording the members an opportunity of purchasing their tickets, both from Washington to New York and from New York to St. Louis and return. At the same time definite arrangements can be made for those desiring to take the Far West trip.

COSMOS CLUB

The Cosmos Club extends its courtesies to all gentlemen from abroad who are members of the Congress. All other members of the Congress may be introduced by members of the club.

PROGRAM OF WASHINGTON SESSIONS

Wednesday, September 7, at 9 p. m.

Informal reception at Hubbard Memorial Hall, Sixteenth and M streets northwest (No. 1 on map), by the National Geographic Society, to meet the delegates and members and associate members of the Eighth International Geographic Congress.

The object of this informal pre-Congress reception is to afford delegates, members, and associates an opportunity to become acquainted prior to the formal opening of the Congress.

Thursday, September 8

Morning, 10 o'clock.—Formal opening of Congress at the George Washington (Columbian) University Hall, Fifteenth and H streets northwest. (No. 4 on map.)

Afternoon, 2 p. m.—Visits to scientific bureaus, under the guidance of reception committees selected by the respective directors.

Evening, 10 to 12.—Reception at the U. S. Naval Observatory by the Superintendent of the Observatory, Rear Admiral C. M. Chester, U. S. N. Arrangements have been made for the exchange of an international telegraphic time signal and message.

Friday, September 9

Morning, 10 o'clock—General session, devoted especially to governmental surveys.

Afternoon, 2 o'clock—Sectional meetings:—

Section A. Physiography of the land.

Section F. Bio-geography.

Section H. Geodesy and geographic technology.

When Section F shall adjourn, on the completion of its work, it will be followed, in the same room, by Section C—Glaciers.

When Section H shall adjourn, it will be followed, in the same room, by Section E—Meteorology and terrestrial magnetism.

5 o'clock—Reception by Mrs Gardiner Greene Hubbard at "Twin Oaks."

Evening, 8 o'clock—Lecture by Mr Charles M. Pepper, "The Bolivian Andes."

Saturday, September 10

Morning, 10 o'clock—Sectional meetings as above.

Afternoon, 2 o'clock—Sectional meetings, continued.

Evening, 8 o'clock—Reception by President and Mrs Peary at the New Willard.

Sunday, September 11

Members so desiring will have the opportunity of spending a few hours on an excursion boat, passing Mount Vernon and other points of geographic interest on the lower Potomac.

At 7 o'clock the Congress will take a Pennsylvania Railway train at the Sixth Street station, arriving in Philadelphia at 10 p. m.

Titles of papers and the order in which they will be read will appear in the daily program.

ORGANIZATION

Honorary President

The President of the United States

President of the Congress

Commander Robert E. Peary, U. S. N.

Honorary Vice-Presidents

Their Excellencies:
Comte Cassini,
The Russian Ambassador.
Señor Don Manuel de Azpiroz,
The Mexican Ambassador.
Baron Edmondo Mayor des Planches,
The Italian Ambassador.
Mr Ladislaus Hengelmuller von Hengervar,
The Ambassador from Austria-Hungary.
Mr J. J. Jusserand,
The Ambassador from France.
Freiherr Speck von Sternburg,
The German Ambassador.
The Right Honorable Sir H. M. Durand,
The Ambassador from Great Britain.
Mr A. Grip,
The Minister from Sweden and Norway.
Señor Don Antonio Lazo Arriaga,
The Minister from Guatemala.
Mr Constantin Brun,
The Minister from Denmark.
Mr J. N. Leger,
The Minister from Haiti.
Mr J. F. de Assis-Brasil,
The Minister from Brazil.
Señor Don Joaquin Bernardo Calvo,
The Minister from Costa Rica.
Señor Don Luis F. Corea,
The Minister from Nicaragua.
Mr Kogoro Takahira,
The Minister from Japan.
Mr Manuel Alvarez Calderon,
The Peruvian Minister.
Señor Martin Garcia Merou,
The Minister from Argentina.
Baron Moncheur,
The Belgian Minister.
Phya Akharaj Varadhara,
The Minister from Siam.
Señor Don Joaquin Walker-Martinez,
The Chilian Minister.
Viscount de Alte,
The Minister from Portugal.
Señor Don Gonzalo de Quesada,
The Minister from Cuba.
Señor Don Emilio de Ojeda,
The Minister from Spain.
Mr Rafael S. Lopez,
The Minister from Salvador.
Señor Dr Alfredo Baquerizo,
The Minister from Ecuador.
Mr Fernand Du Martheray,
The Minister from Switzerland.
Sir Chentung Liang-Cheng,
The Minister from China.
Señor Doctor Eduardo Acevedo Diaz,
The Minister from Uruguay.
Señor Don Cecilio Baez,
The Minister from Paraguay.
Jonkheer R. de Marees van Swinderen,
The Minister from the Netherlands.
Señor Don Ignacio Calderon,
The Bolivian Minister.
Señor Don J. Domingo de Obaldia,
The Minister from Panama.
Chekib Bey,
The Minister from Turkey.
Morteza Khan,
The Minister from Persia.

Honorary Vice-Presidents—Continued

Mr Henry G. K. Heath,
The Minister from the Dominican Republic.
Mr Teh Moo Sin,
The Minister from Korea.
Señor Don Augusto F. Pulido,
The Venezuelan Minister.
Dr Thomas Herran,
The Minister from Colombia;

AND THE

Presidents of Previous International Geographic Congresses

Duca di Sermoneta (Venice, 1881).
Nationalrath Doctor Gobat (Bern, 1891).
Sir Clements R. Markham (London, 1895).
Ferdinand Freiherr von Richthofen Berlin, 1899);

AND THE

Presiding Officers Chosen by Host Societies

G. K. Gilbert (National Geographic Society).
Henry G. Bryant (Geographical Society of Philadelphia).
R. E. Peary (American Geographical Society).
R. D. Salisbury (Geographic Society of Chicago.)

General Secretary

Henry Gannett.

Treasurer

John Joy Edson

Committee of Arrangements

W J McGee, National Geographic Society, Chairman.
Henry G. Bryant, Geographical Society of Philadelphia.
George B. Shattuck. Geographical Society of Baltimore.
A. Lawrence Rotch, Appalachian Mountain Club, Boston.
Zonia Baber, Geographic Society of Chicago.

Committee of Arrangements—Continued

George Davidson, Geographical Society of the Pacific, San Francisco.
Frederick W. D'Evelyn, Geographical Society of California, San Francisco.
John Muir, Sierra Club, San Francisco.
Rodney L. Glisan, Mazamas, Portland.
Angelo Heilprin, American Alpine Club.
Herbert L. Bridgman, Peary Arctic Club.
William Morris Davis, Harvard Travelers' Club.
J. H. McCormick, Secretary.

Finance Committee

John Joy Edson, chairman.
David T. Day. Charles J. Bell.

Executive Committee

R. E. Peary. John Joy Edson.
W J McGee. J. H. McCormick.
W. M. Davis.

Chairmen and Secretaries of Sections

Section A. Physiography of the Land.

Chairman	*Secretary*
W. M. Davis.	Bailey Willis.

Section B. Volcanoes and Earthquakes.

Chairman	*Secretary*
C. H. Hitchcock.	E. O. Hovey.

Section C. Glaciers.

Chairman	*Secretary*
H. F. Reid.	R. S. Tarr.

Section D. Oceanography.

Chairman	*Secretary*
Wm. Libbey.	R. A. Harris.

Section E. Meteorology and Terrestrial Magnetism.

Chairman	*Secretary*
R. DeC. Ward.	L. A. Bauer.

Chairmen and Secretaries of Sections—Cont'd

Section F. Bio-geography.

Chairman	*Secretary*
Angelo Heilprin.	A. S. Packard.

Section G. Anthropo-geography.

Chairman	*Secretary*
W J McGee.	Frederick Starr.

Section H. Geodesy and Geographic Technology.

Chairman	*Secretary*
J. F. Hayford.	E. E. Hayden.

Section I. Explorations.

Chairman	*Secretary*
H. G. Bryant.	H. L. Bridgman.

Chairmen and Secretaries of Sections—Cont'd

Section J. Economic Geography and Hydrology.

Chairman	*Secretary*
E. R. Johnson.	C. W. Hall.

Section K. Educational Geography.

Chairman	*Secretary*
R. E. Dodge.	E. C. Jones.

Section L. Historical Geography.

Chairman	*Secretary*
E. L. Stevenson.	G. H. Grosvenor.

Office Hours: 8.30 A. M. to 5 P. M. Telephone, North 306

NATIONAL GEOGRAPHIC SOCIETY

Hubbard Memorial Hall
Sixteenth and M Streets, Washington, D. C.

W J McGEE . . . . . President
JOHN JOY EDSON . . . . Treasurer
G. K. GILBERT . . . . Vice-President
O. P. AUSTIN . . . . . Secretary
ELIZA R. SCIDMORE . . . Foreign Secretary

BOARD OF MANAGERS

1902-1904	1903-1905	1904-1906
A. GRAHAM BELL	CHARLES J. BELL	HENRY F. BLOUNT
DAVID T. DAY	GEORGE DAVIDSON	C. M. CHESTER
A. W. GREELY	WM. M. DAVIS	F. V. COVILLE
ANGELO HEILPRIN	JOHN JOY EDSON	D. C. GILMAN
RUSSELL HINMAN	G. K. GILBERT	S. H. KAUFFMANN
W J McGEE	A. J. HENRY	WILLIS L. MOORE
GIFFORD PINCHOT	O. P. AUSTIN	ISRAEL C. RUSSELL
HENRY GANNETT	C. HART MERRIAM	R. D. SALISBURY

The National Geographic Magazine is sent free of charge to all members of the National Geographic Society

---

Recommendation for Membership in the NATIONAL GEOGRAPHIC SOCIETY

The following form is enclosed for use in the nomination of persons for membership

Please detach and fill in blanks and send to the Secretary

DUES: Annual membership, $2; Life membership, $50. If check be enclosed, please make it payable to order of the National Geographic Society, and, if at a distance from Washington, remit by New York draft or post-office money-order.

.....*190*

To the Secretary, National Geographic Society, Washington, D. C.:

Please propose.....

address: .....

.....

for membership in the Society.

.....

Neatness Punctuality Fair Prices

JUDD & DETWEILER

PRINTERS

420-22 ELEVENTH ST. N. W.

WASHINGTON, D. C.

Established 1868 Phone, Main 536

"Pillar'd around by everlasting hills,
Robed in the drapery of descending floods."

NIAGARA

FALLS

One of the natural wonders of the world. A charming place at any season of the year, reached from every direction by the

NEW YORK CENTRAL LINES

A visit to the Falls is an object lesson in Geography; an exhibition of landscapes that no painter can equal, and a glimpse of the latest developments of the industrial world.

A copy of Four-Track Series No. 9, "Two Days at Niagara Falls," will be sent free, upon receipt of a two-cent stamp, by George H. Daniels, General Passenger Agent, Grand Central Station, New York.

WE MAKE THE HALFTONE PLATES FOR THIS MAGAZINE

GATCHEL & MANNING

ILLUSTRATORS
AND ENGRAVERS

27-41 SOUTH SIXTH STREET PHILADELPHIA, PA.

The Manhattan Press-Clipping Bureau

ARTHUR CASSOT, Proprietor

NEW YORK (Knickerbocker Building) LONDON

COR. FIFTH AVENUE AND 14TH STREET, NEW YORK

Will supply you with all personal reference and clippings on any subject from all the papers and periodicals published here and abroad. Our large staff of readers can gather for you more valuable material on any current subject than you can get in a lifetime.

TERMS:

100 clippings . . $ 5.00
250 clippings . . . $ 12.00
500 clippings . . . $22.00
1,000 clippings . . . $35.00

HENRY ROMEIKE'S BUREAU OF PRESS CUTTINGS

33 Union Square, New York

Reads every paper of importance published in the United States, and through its European agencies in London, Paris, Berlin and Vienna every paper of importance published in Europe and the British Colonies. One subscription on any given subject will bring notices from the United States, and if desired also from the European papers.

WRITE FOR TERMS

Back Volumes

OF THE

National Geographic Magazine

The NATIONAL GEOGRAPHIC MAGAZINE has on hand a few copies of complete back volumes which may be obtained at the following prices:

Vol. 3, 1891 . . .	$5.10	Vol. 9, 1898 . . .	$2.75
Vol. 5, 1893 . . .	4.50	Vol. 11, 1900 . . .	2.50
Vol. 6, 1894-5 . . .	4.20	Vol. 12, 1901 . . .	2.50
Vol. 7, 1896 . . .	3.25	Vol. 13, 1902 . . .	2.50
Vol. 8, 1897 . . .	3.00		

The NATIONAL GEOGRAPHIC MAGAZINE will pay the following prices for copies of certain back numbers:

Vol. 1, 1889, No. 2, $1.00; No. 4, $1.00.

Vol. 2, 1890, No. 2, $1.00.

Vol. 4, 1892, No. 1, $0.50; No. 2, $1.50; No. 3, $0.50; No. 4, $0.50; No. 5, $1.00; No. 6, $1.00.

Vol. 10, 1899, No. 6, $0.50; Index, $0.50.

Vol. 13, 1902, No. 1, $0.30.

Hubbard Memorial Hall . . . Washington, D. C.

Our "Exposition Special" Traveling Trunk

WHETHER you are going to St. Louis, to Europe, or to 'Frisco, we are splendidly ready to equip you with the necessary things, in a leather way.

We call attention to our **"Exposition Special"** Trunk, which has the following five points to recommend it:

Point 1—5 White Ash Slats on Top
Point 2—No. 5 Taylor Bolts
Point 3—3 Center Bands
Point 4—Metal Tray Lid Hinges
Point 5—Concealed Cup Lock; practically burglar-proof

Other trunks may have any one of these points, but ours is the only trunk that has all five combined. We had this trunk made expressly for us and it is controlled by us. It is the best trunk made at the price.

28-inch, $7.95	34-inch, $10.00
30-inch, 8.50	36-inch, 11.00
32-inch, 9.00	38-inch, 12.00

40-inch, $12.75

BASEMENT, EQUITABLE BUILDING

WOODWARD AND LOTHROP

New York Washington Paris

SPECIAL MAPS PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY

Map of Manchuria and Korea (36 x 42 inches).
Prepared under the direction of the War Department.

Map of the Philippines (5 feet 2 inches x 3 feet).
Prepared under the direction of the War Department.

Map of South Africa (46 x 33 inches).
Prepared under the direction of the War Department.

Map of Northeastern China (36 x 28 inches).
Prepared under the direction of the War Department.

Map of Alaska (28 x 24 inches).
Prepared under the direction of the U. S. Geological Survey.

Map Showing Alaskan Boundary Award (12 x 12 inches).
Prepared under the direction of the U. S. Coast and Geodetic Survey.

A Series of Twelve Maps on the Alaskan Boundary Dispute.
Prepared under the direction of Hon. John W. Foster, ex-Secretary of State.

Chart of the World on Mercator's Projection (48 x 27 inches).
Prepared under the direction of the Hydrographic Office.

Map of Cuba (18 x 7½ inches).
Prepared under the direction of Robert T. Hill.

A Series of Twenty-five Full-page Charts, showing storm tracks and methods of weather forecasting.
Prepared under the direction of Dr. Willis L. Moore, Chief U. S. Weather Bureau.

Panorama of the Wrangell Mountains, Alaska.
A remarkable picture, showing scores of lofty peaks in an area as large as the State of Delaware.

By Mail for Twenty-five Cents Each.

NATIONAL GEOGRAPHIC SOCIETY, Hubbard Memorial Hall, Washington, D. C.

PRESS OF JUDD & DETWEILER, WASHINGTON, D. C.